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The MONTHLY REVIEW

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American Electro-Platers' Society

A SOCIETY FOR THE ADVANCEMENT
OF THE
SCIENCE OF ELECTRO-PLATING

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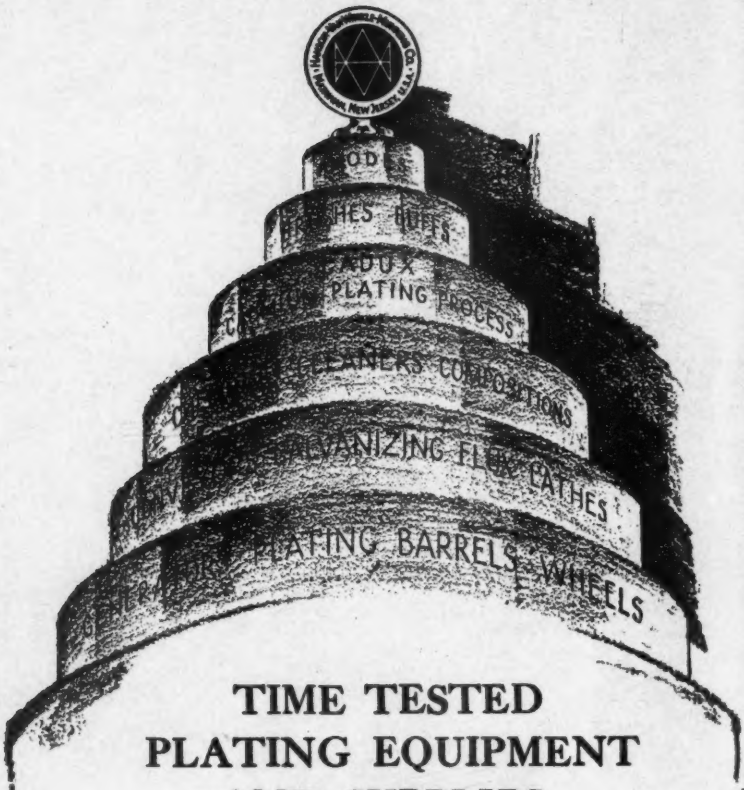

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EDITORIAL

"THE A. E. S. IS ON ITS WAY"

THERE may have been as good conventions in past years, and we may have them in years to come, but they will never surpass the Detroit Convention just held, in co-operation, optimism, progress, and sociability. From start to finish it was a distinct success. The papers read at the Educational Sessions were exceptionally good. The business transacted will have a far reaching effect in the future, and the way the various committees of the Detroit Branch and the good Fellowship Club entertained us was all that could be desired. The attendance, too, was a surprise, proving beyond a doubt that times are better, and that the sun is shining through the clouds that have overshadowed our industrial horizon for the past few years.

THE EDUCATIONAL SESSION

These sessions were in charge of Messrs. E. Steen Thompson, T. Slattery, Dr. Blum, W. S. Barrows, and W. M. Phillips of General Motors Corp. The papers read and discussed were well given and thoroughly enjoyed, especially those that were illustrated by lantern slides. Mr. Phillips of the General Motors Corporation kept the audience spellbound as he demonstrated plating conditions by using the stereopticon projector in presenting his paper. The speaker's humorous remarks made everyone forget that it was "way past bedtime" back home. Mr. Phillips was given a great hand at the close of his address. Pictorial studies of plating conditions made a big hit. All the papers were very instructive, the sessions were well attended, the members were prompt, and the discussions most interesting.

THE RESEARCH COMMITTEE

The outlook for continuing Research was gloomy as the matter was discussed by the Executive committee on Monday morning

previous to the business session. The President, Mr. Van Derau, addressed the convention regarding this subject, reporting that unless something definite was done, Research would be discontinued because of our financial condition. Then things began to happen. Mr. Schwartz of United Chrome Corporation started the ball rolling by pledging financial aid in an interview with Mr. Van Derau. This looked so good that the President called a meeting of past presidents, the executive committee, and representatives of the manufacturers and supply house men. Before the meeting adjourned, it was evident that the Research would continue. At the final business session, it was voted to carry on as follows:

"That a Research of non-ferrous metals would be started at once for a two-year period at a cost of $5,000 per year to be financed by assessing $1,000 dollars on the A.E.S. membership, same to be taken from the National Treasury; $2,000 to be contributed by the supply houses; and $2,000 from the manufacturers."

There was a general feeling of satisfaction with this arrangement and the vote on the motion was unanimous.

MEMBERSHIP

A strong appeal was made by several prominent members of the organization to admit assistant foremen and others interested in electroplating to our organization as active members. After much discussion favorable to the proposal, it was decided to appoint a committee that will report to the Executive Board by Jan. 1, 1935, the attitude of the various branches on the subject. With one or two exceptions, the delegates felt that action in this respect cannot be delayed much longer, and it is anticipated that the vote of the branches will be overwhelmingly in favor of admitting the assistant foremen at least into our membership, either as active or associate members.

HONORARY MEMBERS

Mr. George B. Hogaboom, because of his outstanding work in the A.E.S., was made an honorary member on a motion by past-president Walter Fraine. This item of business was one of the high lights of the convention, and applause of all present testified to the high esteem in which Mr. Hogaboom is held by the members of the Platers' Society.

PAPER AWARDS

The Paper Awards Committee deplored the fact that so few papers were being prepared and read by active members of the Society. It is hoped that at the next convention's educational sessions more papers by practical platers will be read.

THE FOUNDERS GOLD MEDAL

For the third successive year, the Founders Gold Medal was not awarded. Something should be done about this, as it is a distinct favor to possess this beautiful trophy.

THE NEXT CONVENTION CITY

Bridgeport, Connecticut was chosen as the 1935 convention city. Ray O'Connor swept all opposition aside as he extolled the merits of his home town. This silver tongued orator knows how to boost New England and the success of next year's gathering is already a foregone conclusion, with Ray directing affairs. The New England Branches — Boston, Springfield, Hartford, Waterbury, Bridgeport, and Providence will unite to make this the best convention ever held.

THE REVIEW

The Review became self-supporting in the first year it has used paid advertising. As a result, the Supreme Society starts the new year with over two thousand dollars in the treasury with all bills paid. Members of the A.E.S. — It pays to advertise!!!

THE NEW OFFICERS

Mr. H. A. Gilbertson of Chicago Branch was elected President.

Mr. Joseph Underwood of Philadelphia Branch — First Vice-President.

Mr. T. Slattery of Baltimore-Washington Branch — Second Vice-President.

Mr. E. Steen Thompson of Cleveland Branch — Secretary-Treasurer.

Mr. Wm. J. R. Kennedy of Hartford-Connecticut Valley Branch was re-elected Editor.

THE RETIRING PRESIDENT

Mr. Clarence Van Derau, for the last two years Supreme President, did a splendid job as presiding officer. His diplomacy and level-headedness especially in the closing business session saved some embarassing situations. We speak for the whole organization when we hope that "Van's" interest in the future of the A.E.S will continue for many years to come.

THE NEW PRESIDENT

Mr. Gilbertson, our new president, deserves the honor. He has made a splendid record as Secretary-Treasurer. As an executive, he is cautious, enthusiastic, and a hard worker. His program for the coming year will require every member's loyal support. It looks as though this year will be one of the best in our history. Let's support the president, not grudgingly, nor of necessity, but let us give him and all the Supreme Officers the best that is in us and show the world that the A.E.S. is on its way.

DETROIT BRANCH SECRETARIES REPORT OF 22ND ANNUAL CONVENTION HELD IN DETROIT, MICHIGAN, JUNE 11 - 14.

Report Submitted by A. G. Spencer and T. C. Eichstaedt

THE twenty-second annual convention of the Society is now past history and most of the delegates and visitors with their wives, families and friends have returned home or journeyed elsewhere on business or pleasure trips.

The Weather Man was especially favorable to us and, unlike in many years previous, gave us moderate temperatures, and no rain, except late on the first evening when it helped to clear the air for the next day. The decision of the Detroit Branch in advancing the dates of the Convention earlier than allowed by the Constitution of the Society, although made necessary by reasons of inability to secure Hotel and Convention accomodations from June 20th to July 10th, was found to have been a good one.

The Local Committees under the able and experienced direction of "Bill" McCord worked hard all year in preparing and arranging for all the various details that go to make any convention a success or a failure. It is the little things that irritate and it is the little things that give added enjoyment, and it was to the little things that the Committees gave most attention, particularly, at the last. The officers and staffs of the Statler Hotel, Convention Headquarters, and of the Convention Bureau of the Detroit Board of Commerce gave every assistance and cooperation. To the Statler Hotel are due the thanks of the Local Committees for providing the air-conditioned Auditorium and Banquet Hall, suites for the officers of the Supreme Society and Committee Rooms, also projection lanterns, loud speakers and their attendants, etc. To

the Convention Bureau they are indebted for the courteous ladies at the Registration and Information desks and those supervising the arrangements for the ladies entertainment and for the plant trips.

To the International Fellowship Club and subscribing friends great credit should be given in providing and arranging for the opening party on Monday night at the Everglades Club. It broke the ice and allowed everyone to become mutually acquainted and to make the contacts that are so valuable in any convention.

Finally to those who subscribed for the advertisements in the Official Program are due the greatest thanks for ensuring the financial success of the convention and allowing the Registration fees to be so low. Conventions always must be financed.

The activities of any Convention naturally divide themselves into several groups: Business, Educational and Entertainment. The last two should, and often do, combine so that a plant tour or pleasure trip may be both educational and entertaining.

BUSINESS MEETINGS

Business meetings were held on Monday morning and Wednesday evening. On Monday morning after an address of welcome by Mr. J. H. Hansjosten, President of Detroit Branch in his customary happy manner and a reply by our esteemed and hard-working Supreme President, Mr. Clarence Van Derau, the annual reports of officers were presented, Committees were appointed and certain resolutions were read and new items of business introduced, all of which were ordered referred to special committees for consideration during the Convention and submission for final consideration at the last business meeting on Wednesday night.

The reports of President Van Derau, Secretary-Treasurer Gilbertson, Editor Kennedy and Vice-Presidents Thompson and Slattery, also of the Research Committee. No doubt these will be published in future issues of the Review, but some of the high lights may be mentioned.

President Van Derau after reviewing the work of the past year and thanking the Officers for their support and cooperation spoke of the effect of the general business depression on the affairs of the Society, as a whole and of the Branches and their individual members in particular. Many members had lost their positions or were reduced in salaries, so that they were unable to retain their memberships in the Society. The Branches in their endeavor to hold them had kept up payments to the Supreme Society, until their finances were exhausted and had not suspended members who were in arrears until compelled to do so. The Branches in turn were behind in their quotas to the Supreme Society and to the Research Fund and all in all the affairs of the Society at the beginning of the fiscal year were in a bad way. But due to a certain improvement in general business conditions in most parts of the country, to the efforts of the Supreme and Branch officers, and, as regards the Research Fund, to unsolicited but welcome and timely support from an outside source the Society has come through with a balanced financial statement, and all but three of the local Branches have paid up their arrears of per capita tax, and of those still in arrears there was every possibility that they would make good within the next six months.

Mr. Gilberston, Secretary-Treasurer also spoke along the same lines, and,

along with President Van Derau and Editor Kennedy, mentioned the evident necessity for a broadening of the outlook and purpose of the Society, if it were to maintain its existence, promote the knowledge of plating among its members, and improve the quality and use of plated goods in general. To this end some changes may be necessary in the articles of the constitution.

Mr. Kennedy, Editor of the Review states that the change made at the Chicago meeting of accepting paid advertisements had been a financial success and in the ten months just past had paid its own way without calling on the Supreme Society for its quota of the per capita tax, thus freeing an amount of money that was badly needed for carrying on the other activities. He urged all the members to boost the Review by preparing articles for publication and by personal solicitation for advertisements, so that the official publication of the Society might become, not only self-sustaining but an added source of revenue. Increased membership was necessary if present advertising was to be retained and increased and if second-class postal rates were to be given the Review by the United States Postal Department.

Mr. Steen Thompson, 1st Vice-President, showed that while the total membership had dropped due to financial considerations the slates of the Branches had been cleaned and that a noted increase in membership was already evident.

Mr. Slattery, 2nd Vice-President, spoke of the papers prepared by the Educational Committee for use of the Branches and Review and of the addresses given by Dr. Blum, Mr. George Hogaboom and others during the year.

Mr. Walter Fraine, for the Research Committee reported the efforts of the Society's officers in continuing the Research program and when almost at the end of their resources of their rescue by a large corporation through an offer to finance the program for the balance of the year until the present Convention had the opportunity to make further arrangements. He also spoke of the advisability of preparing further exposure test panels of electroplated coatings on non-ferrous metals in addition to those now under test on steel panels.

One of the pleasant features of the business sessions was the presentation of an Honorary Membership to Mr. George Hogaboom, who has held most of the offices of the Society and has given so much of his time and energy to advance the affairs of the Society and of the plating industry in general, but who on account of his business connections is now not eligible for active membership.

Another one was the good fellowship and freedom from exhaustive arguments on any question under consideration. Once or twice the members began to wander away from the subject but were brought back to earth in a diplomatic manner by the President.

The Master Platers' Institute, who had just completed a two days Convention in Detroit for the purpose of organizing under President Roosevelt's N.R.A. code presented greetings and most of them remained over for the A.E.S. meetings. They plan to hold their annual convention just previous to ours in future years and we can look forward to their presence and help at these meetings.

In addition to the customary resolutions of thanks to the Detroit Branch, International Fellowship Club, Statler Hotel, and Convention Bureau, officers and employees, the following main items of business were adopted:-

(1) Branches delinquent in per capita tax were allowed six months in which to pay up or re-organize. It was suggested that the Branches reinstate

members suspended for non-payment of dues by allowing them to pay up the per capita tax only.

(2) Research Fund to be re-financed at an annual cost of $5,000.00 a year for two years by

(a) $1.00 per year per member to be paid out of the Supreme Society per capita tax.

(b) One-half of balance (about $2000.00) to be subscribed by plating manufacturers and users of plated ware.

(c) One-half of balance (about $2000.00) to be subscribed by plating supply houses and dealers.

(3) Discussion on articles of the Constitution relating to membership was referred to a Committee to be appointed by the President and their report to be submitted to the Branches at as early a date as possible for vote and adoption before next Convention.

(5) New officers for 1934-1935 were unanimously elected:

President — Mr. H. A. Gilbertson, Chicago Branch

1st Vice-President — Mr. Underwood, Philadelphia Branch

2nd Vice-President — Mr. T. F. Slattery, Washington Branch.

Secretary-Treasurer — Mr. E. Steen Thompson, Cleveland Branch.

Editor — Mr. Wm. J. R. Kennedy, Hartford-Connecticut Valley Branch.

They were installed by Mr. George Hogaboom at the Annual Banquet on Thursday night.

(6) Place of 1935 Convention — Bridgeport, Connecticut.

EDUCATIONAL SESSIONS

The air-conditioning equipment of the Auditorium of the Statler Hotel fortunately was not found necessary on account of the coolness of the weather, but was available if it had been necessary. The microphones worked when the various speakers got over their mike fright and remembered to speak into it. The projection lantern also was in greater demand than in past years, as more lantern slides were presented.

The reports of researches at the Bureau of Standards by Dr. Blum and his associates is always one of the outstanding features of the Plater's Convention, and it was true this year too. Dr. Blum has the happy faculty of presenting his summary of the work or in answering any questions in such a clear and connected manner that everyone understands what he is talking about, and he is never at a loss for the right word in the right place whether it is a technical term or a slang expression. His enunciation is so clear that everyone can hear him even without the microphone.

On Tuesday evening two papers were given on metal cleaning and the one by Mr. W. M. Phillips was one of the outstanding features of the Convention. His projection on the screen of nickel, copper and chromium plating solutions in action was so interesting that everyone was disappointed that it could not be prolonged for hours. The heckling by the audience when the plate began to peel and the apt replies of the speaker added to the enjoyment of the demonstration. Even Dr. Blum, the Chairman, joined in.

PLANT VISITATION

No plant visits were arranged for Monday and Tuesday, but on Wednesday afternoon the Ford Motor Company Plant was opened for us and on Thursday morning a choice was possible from among six plants; namely, Graham Paige,

Motor Products, Chrysler-Jefferson Avenue, Chrysler-Plymouth plants, Chrysler-Engineering Building and General Motors Research Building.

ENTERTAINMENT AND LADIES PROGRAM

Monday afternoon for the ladies was given over to a trip through Detroit Zoological Park and on Monday evening, as previously mentioned, the International Fellowship Club, cooperated with the Detroit Branch in arranging a party for both men and women at the Everglades Club, where a buffet supper and refreshments were provided and dancing or cards were indulged in as desired. Many seemed content to wander around renewing old friendships made at previous conventions and making new ones.

On Tuesday the ladies were served luncheon at Dearborn Inn opposite the Ford Airport and but a minute's drive to Greenfield Village where they were joined by the men in a trip through Mr. Henry Ford's Museum and collection of old and historic American pieces. The part devoted to Thomas Edison's Laboratories as well as the lecture given to some of us fortunate ones by Mr. Jehle, one of Mr. Edison's original employees was especially interesting.

On Wednesday the ladies were given a bus ride around Belle Isle to the Detroit Yacht Club where luncheon was served followed by a bridge party in the afternoon. In the evening a theater party at the Michigan Theatre was provided — a section of the theater being reserved for their use.

No arrangements were made for the ladies for Thursday morning and afternoon, as it was expected they would be engaged in resting or shopping in preparation for the final Banquet and Dance in the Ball Rooms ot the Statler Hotel.

Before concluding the Banquet and adjourning to the other Ball Room for dancing the new officers were installed by Mr. George Hogaboom and the prizes awarded for the two best papers by the members of the Society during the past year. "They were awarded to Mr. Ray Goodsell, Milwaukee Branch, Racine Plating Works, Racine, Wisconsin for his paper entitled "Nickel Plating" and to Mr. Clandinnen, Chicago Branch A.E.S. for his paper on "Metal Cleaning."

Altogether a profitable time was had by all as well as a pleasant one. If any plater has returned home without taking something back with him that will help him in his work and benefit the concern by whom he is employed it will have been through no fault of the Executives of the Supreme Society and the various Committees of the Detroit Branch.

Here's to next years convention at Bridgeport, Connecticut, and a bigger and better one.

INTERNATIONAL FELLOWSHIP CLUB

THE International Fellowship Club held its annual business meeting and luncheon on June 14, in accordance with its custom of doing this during the A.E.S. convention every year. New officers of the club were elected, as follows:

President—T. B. Haddow of Newark, N. J., formerly vice-president.

Vice-President—H. M. Cherry of Detroit, Mich.

Secretary-Treasurer—Thomas A. Trumbour of New York.

OPEN HOUSE

The Fellowship Club held its annual Open House Monday evening, June 11. It was the most successful open house the club has ever held. This function annually serves to start the A.E.S. convention off, bringing together all the members and guests the first evening, for entertainment and refreshment. It puts everyone in a fine frame of mind, helps to bring about new acquaintanceships and to renew the old. This year it was more successful than ever in this way, and much credit is being given to the Fellow ship Club for giving the whole convention a fine start.

MASTER ELECTRO-PLATERS INSTITUTE

THE annual meeting of the Master Electro-platers' Institute of the United States was held in Detroit, June 9-10, at the Statler Hotel. The meeting was attended by a larger crowd than ever before. The delegates and guests were full of enthusiasm for the progress of their organization.

Saturday, June 9th was devoted to business meeting with reports, suggestions and petitions from branch associations. These suggestions and petitions were laid before committees and action taken on them at a later session. In the afternoon a number of amendments to the Constitution and By Laws were presented. Most of them were formal or technical in character to comply with legal details.

One of the important amendments opened membership in the Institute to all persons who have owned and operated electro-plating job shops in the past and are no longer so engaged, and also to business enterprises engaged in the supplying of materials and equipment used in the electro-plating industry.

Reports were received from the Treasurer, from the Code Committee which had represented the Institute in Washington and from the Cost Committee working on the standard methods of estimating and figuring costs of job plating work.

The last business of the Saturday afternoon session was the election of officers. The following were chosen:

President, James J. Gerity, Jr., Toledo, Ohio.
First vice-president, Leo Jensen, Chicago, Ill.
Second vice-president, Philip Sievering, Jr., New York
Third vice-president, Mr. Carr, San Antonio, Texas.
Secretary-treasurer, R. J. Nagle, Toledo, Ohio.
Counsellor, Edward Musick, St. Louis, Mo.

LOW VOLTAGE MOTOR GENERATOR SETS

By George L. Nankervis

Read at Detroit Branch Meeting

THE subject of low voltage motor generator sets which we are principally interested in — namely, the plating type of generator — is most interesting to us people of Detroit, for we believe we can safely say that the compact, high efficiency, easily adjustable, and minutely regulated low voltage generator being manufactured today is the result of research and engineering made necessary by the strict demands created by the advent of chrome plating, as well as high production automatic operation in the automotive and its allied businesses in Detroit.

The first motor generator set of which we have any record, or rather the first motor generator set that was used for any degree of production work, was manufactured in 1844 by a man named Woolrich. This motor generator set was naturally very crude. If you were to see this set today, you would be amazed by its peculiar design, particularly so in comparison with the sets manufactured today. A few gauze wire brushes on a very crude commutator delivered the voltage and amperage required for the very limited production which was prevalent at this time. It takes but a very short memory to recall generators in job shops and on production jobs that were not such a great improvement over this type of set. You can remember the old type generators; in fact, you can see them in operation today with a quarter of an inch of copper dust lying on the base, and so much dust and dirt accumulated on the name plate that in some cases it is necessary to scrape this off before you can read the name of the manufacturer.

To say the least, motor generator sets in instances up to the last few years have had more than their share of abuse. This in spite of the fact that when your motor generator set is down, your production is paralyzed. In other words, your generator is the most vital part of your plating plant, and during these past five years I believe it is becoming recognized as such, and is receiving the attention it deserves, for in the up-to-date installations generators are placed in a room by themselves, and in many instances with washed air ventilation. The deficiencies of generators of this old type were not considered, and voltage regulation was entirely out of the question. With such sets it would be practically impossible to do any chrome plating at all, and to meet the demands of present-day production and

overloads, the old type generator would be entirely inadequate.

Briefly, direct current generators classed with reference to the excitation come under four principal classifications. First, series-wound generators. These generators are seldom used today. This is one of the original type sets, and as your load in amperes is applied, the voltage increases.

The second class is shunt-wound generators. In this type of generator, your maximum voltage is reached with no load in amperes on the generator, and as the amperes increase the voltage decreases. The excitation current for the fields of a generator of this type is derived from the commutators of the generator.

The third class is the compound-wound generator. This type generator is a combination of a series and a shunt-wound generator. The voltage of a compound-wound generator remains practically the same from no load to full load. Generators of this class can be used on plating barrels, or on any production job where a constant voltage is required. A generator can be compound-wound whether it is self-excited or separately excited. The foregoing remarks are on a self-excited compound-wound generator set. In making a compound-wound generator, we take the shunt-wound generator and add a series-winding to it in order to compensate the drop in voltage which we mentioned above as being essential to the characteristics of the shunt-wound generator. A generator may be compounded in a number of different ways — directly or indirectly. However, the results are substantially the same as with the usual method of compounding mentioned above, which consists of adding a series-winding to carry the armature current of the machine. By correctly proportioning the two windings, the generator can be made to deliver current at the same constant voltage from no load to full load. This is generally called flat compounding, and is most desirable. It may be arranged so that the voltage at full load is higher than the voltage at no load, and conversely.

Suppose that a generator is compounded to deliver six volts at zero amperes and six volts at two thousand amperes; if we reduce the voltage by means of a field rheostat so as to drop the voltage to five at no load, at the same time we alter the relation between the shunt and the series winding; we will no longer have the same voltage at full load that we had at no load, but we will have a higher voltage; how much higher depends entirely on the good, bad or indifferent design of the generator.

Now, dropping the voltage at no load to four volts will further alter the relation between the shunt and the series field with the result that we will have considerable more than four volts at full load. If we go down to two volts at no load we may have three volts, three and a half volts, and even four volts at full load, depending on the generator's design, and if we kill the field at no load so as to obtain virtually zero, the series winding will cause the voltage to rise perhaps to two and a half volts, three volts, or three and a half volts, always depending on the design of the machine.

Thus we see that a compound winding affects the control of a generator and that a generator desired for flexibility of voltage should be excited separately.

Any commutating pole type machine properly designed can be made to assume a compound characteristic by shifting the brushes from their normal point. The amount of shifting determines the amount of compounding desired.

In principle, shifting is objectionable. A small amount of shifting may not be very objectionable. The role of the commutating poles is to help commutation; they should not be expected to take the place of the series winding placed on the main poles to maintain constant voltage.

The fourth class is the separately excited generator, which is sold almost exclusively today. This generator, with which we are particularly acquainted, I assume, receives excitation for its fields from a separate motor generator set, a direct connected generator, or an outside D.C. source. The latest type of separately-excited M.G. set has been improved recently by the direct-connected exciter. In this manner the exciter is an integral part of the M.G. set, the exciter being mounted on the same common base, and being directly mounted on the same common shaft. Separately excited generators, generally speaking, have a slight drop in voltage from no load to full load. A few years ago it was not uncommon to have a voltage drop on a six-volt M.G. set of from one to two volts from no load to full load. However, with improved series-winding where it is requested, M.G. sets can be manufactured now with a guaranteed voltage drop of from three to five per cent. As a consequence, the voltage can be entirely controlled from the field rheostat on your generator and will do away entirely with the necessity of tank rheostats which are used to control the voltage at your

tanks. In other words, if you have a five thousand-ampere six volt motor generator set attached to a semi or full automatic plating machine, and you require five volts at all times to be delivered in this tank whether the tank is full or not, you can set your voltage with your field rheostat at the generator and leave it all day long and you will have a constant voltage within three to five per cent, if specified, at your tank, whether it is full or empty or whether the generator is drawing five thousand amperes or no amperes.

The principal reason for this late development in voltage regulation is a special series-winding with particular emphasis on its proper design. Then, too, this low voltage regulation would be impossible if it were not that this machine was operated by a synchronous motor and a direct-connected exciter. An overhung type synchronous motor and a direct-connected exciter are most essential in reducing the permanent losses on an M.G. set. A synchronous motor with a direct-connected exciter running at a uniform speed which is inherent in all synchronous motors under all conditions of load, if the excitation remains the same the generator's pressure drop with the brushes at neutral will be practically limited by the ohmic resistance. The exciter being direct-connected and its speed remaining constant under all conditions of load, whether full load or no load, the excitation of the generator will remain constant and the conditions mentioned above will take place. If the exciter is not direct-connected, but is geared or chain-driven so as to prevent all slippage, the same results will be obtained as with a direct-connected exciter. If belt-driven, it is necessary to keep the belt in first class condition at all times, and also necessary to avoid slippage. Induction motor-driven generators will sustain a loss of the speed between no load and full load, which loss of speed will result in a corresponding drop in voltage or pressure, the excitation remaining constant. That drop of pressure due to drop in speed will be in addition to the drop due to ohmic resistance. A direct-connected exciter on an induction motor-driven set will also sustain a loss in speed under full load conditions, which will result in a drop in its voltage causing a loss of the generator excitation and causing another drop in the voltage of the generator. With geared or chain driven exciter, results will be the same as with direct connected exciter. With belt-driven exciter, belt slippage will have to be accounted for.

In the case of either synchronous motor-driven generator or induction-motor generator, it is possible to maintain constant excitation by supplying a separate motor generator set for that purpose.

A reason at times advanced against the use of synchronous motor generator sets is that the starting equipment is complicated and expensive. However, such impressions are ill founded, for the types of starters furnished on modern sets is entirely automatic. Push a button to start; push another button to stop. The starter is equipped with overload protection, low voltage and no voltage protection. Simply closing the switch on the circuit of the synchronous motor is all that is necessary, for it requires no more current to start the properly designed synchronous motor than it does to start certain types of squirrel cage motors. In other words, any type of starting device that can be used on a squirrel cage motor will start the properly designed synchronous motor for a plating generator set.

In the foregoing remarks we have stressed the advisibility of overhung type synchronous motors, which were first introduced several years ago, and from a number of sources there were objections that time has proven were ill founded, for this type motor is furnished almost exclusively on the M.G. set of highest efficiency manufactured today. It is also advisable, when purchasing motor generator sets of any size from 6 kw. up, to check the power factor of your plant, and if it needs any correction, purchase a leading power factor motor on your set, for the results in many instances are beneficial beyond the expectations of the purchaser.

When motor generator sets are purchased today the subject of efficiency is usually discussed. Efficient operation in a motor generator set, however, is something that was barely thought of prior to 1925. In fact, most of the machines manufactured prior to this date would have considerable difficulty in showing over-all efficiency of 50%. We know this to be a fact from statistics. Today it is possible to furnish low voltage M.G. sets of certain types and sizes that will show an overall efficiency as high as 85% and a little above. Of course, a generator set that would be most desirable would be one of 100% efficiency, but there are certain losses that must be considered and which are fundamental laws. The losses that occur in low voltage generators are two kinds: First, permanent losses which are always

present whether the machine runs at full load or no load. These losses are usually considered as overhead. Second, variable losses, which vary as the load. The permanent losses are: first, bearing friction and windage; second, brush friction; third, magnetic friction in the armature, otherwise known as core loss or eddy current; fourth, shunt field excitation. Now, take the first three permanent losses, and you will agree that it is obvious that if we could get current from a generator running at a speed of no revolutions per minute the bearing friction and the windage would be zero, the brush friction would be zero, and the magnetic friction in the armature, or core loss, would be zero. Of course, we cannot do this, for we must have our armature revolve. However, you will agree that the slower the speed of a machine the smaller these losses will be, the larger the machine will be, and the more copper used. The fourth item in the permanent losses, which is shunt field excitation, is of a different nature, and will be smaller, other things being equal, as the speed increases. Therefore, there is a point in the design of any machine where the speed is most economical. The variable losses in the generator are also four in number. First, current squared multiplied by the resistance of the armature; second, current squared multiplied by the resistance of the commutating pole windings and of the series field windings, if any; third, current squared multiplied by the resistance of the brushes, pigtails, brush holders and the brush yokes; fourth, current multiplied by the brush drop in volts. The current squared factor in these formulas is something that the designer cannot control, because the purchaser tells him he wants so many amperes and in order to get him that many amperes with a minimum loss, he has to reduce the resistance of the circuit, something that he can do by increasing the cross section of the conductor. The brush drop is a big item in most generators, and is not generally appreciated by the purchasers because it is very little understood. There is only one way to find this out, and that is by measuring it, something that is very rarely done by generator manufacturers in general, or even by the companies manufacturing brushes. With reference to brushes, it might be interesting to you to know that the first copper graphite brushes were introduced about twenty-five years ago. At first they were not at all satisfactory, and it was not until about 1920 that they came into general use. Since that time they have been improved considerably.

In purchasing an M.G. set, it is most essential that the manufacturer knows exactly the conditions under which this set is to be used, whether it is to be used on one load or one tank, whether it is to be used on a full automatic, or whether it is to be used on a series of different tanks. An M.G. set should be prescribed and built to your particular requirements. I have in mind one company who purchased a three thousand amperes six volt M.G. set and when they found out that they could get four thousand amperes at eight volts they severely criticized the manufacturer for giving them this overload, arguing the fact that such a generator set must necessarily have a large motor which increased their power consumption. Common sense will show you such a stand is absurd; nevertheless, such things do happen, and for that reason a purchaser should know what he is getting before he receives the machine. A good M.G. set naturally has a low temperature rise. However, there are some cases where extremely difficult situations arise, and unusual specified temperatures guaranteed to meet. For instance, we can design a low voltage generator specified at five thousand amperes at six volts, along two distinct lines. First, to meet a specified temperature guarantee; second, to have the maximum desired commercial efficiency. To meet a specified temperature guarantee, only sufficient magnetic material will be used to produce six volts at full load and that magnetic material will be worked as high as permissible to keep the losses and resulting temperature within the specifications. The field excitation must just be sufficient to produce six volts at a full load and the quantity of material can be cut down to a minimum that will meet the temperature guarantee. Necessarily a generator as designed will have very little overvoltage capacity.

On the other hand, if our aim is the highest desirable commercial efficiency, we will work our magnetic material at low density to keep down the losses and such low densities will require but a low exciting current. For the purpose of minimizing the excitation losses if a generous amount of copper is provided in the fields, our generator will not only operate with a low temperature rise at six volts but will be capable of operating and generating a much higher voltage. The designer of a five thousand-ampere generator to meet a specified temperature guaranty will use a cross section of copper just sufficient to carry the five thousand amperes with losses that when converted into

heat will not exceed the specification. To keep the losses in the armature and commutating pole conductors within the desirable limits of a commercial high efficiency machine, the manufacturer is compelled to use a very much larger cross section and therefore that extra copper is available to carry extra amperes.

The use of fans, ventilating ducts, higher speeds, etc., to dissipate the heat generated by the losses are means in common use to keep down the temperature rise with the specified limits; thus, greater losses can be permitted, the dimensions can be reduced, with the attendant economy in material and labor, but at the cost of efficiency. The purpose of the designer of a high efficiency machine being to avoid the losses, he has to rely principally upon the excellency of his design and the employment of the best material, and that in generous quantities.

One of the late developments in plating generators is the twin type set which consists of two single commutator generators, driven by one motor and excited by one exciter. This new development in the line of M.G.s offers great possibilities. Their use is increasing rapidly, and their popularity is assured by their merits. An improvement in efficiency is developed. This type of a set occupies less space, being more compact than two separate units and only one starter is required. It is also only necessary to wire to one motor instead of two. There are certain limitations, however, in size, where it is advisable to use the twin type set. A few years ago the best overall efficiency that a particular manufacturer could guarantee on a 1500-ampere M.G. set was 69.5% at full load. However, with a twin type 1500-ampere set operated by 30 H.P. synchronous motor, and excited by one direct connected exciter, showed an overall efficiency of 75.5% at full load and 76.5% when carrying a 25% overload in volts and 33-1/3% overload in amperes at the same time. An improvement in efficiency had, of course, been expected, for the unit having now a total rated capacity of 3000 amperes.

The twin type M.G. set has also marked advantages over the ordinary double commutator, single field, single armature, core type generator which may be regarded as a standard today. The standard double winding, double commutator, generator can be operated, first with the commutators in parallel; second, with the two commutators in series; third, as a three-wire machine. The voltage of each commutator of the standard generator remains equal, and when operated as a three-wire machine, it

is not advisable to unbalance it much and it is certainly bad practice to load one commutator and then the other alternately. These restrictions do not affect the twin type machine, for they operate, first, two commutators in parallel; second, two commutators in series; third, as a three-wire machine; fourth, as two entirely independent machines; fifth, the voltage of the commutators may be zero on one side, maximum on the other side; sixth, the load in amperes may be zero on one side, 100% overload on the other side; seventh, it is quite practical to operate the twin generators in parallel or in series from the same rheostat.

The amount of floor space occupied by the twin type M.G. set is only three or four inches longer than that of the standard single field generator.

Twin type M.G. sets can be had to operate at one specified voltage on one generator, and higher voltage on the other. For instance, you can have a six-volt generator on one side and a twelve-volt on the other. You can have 1500 amperes at twelve volts on one generator and 2500 amperes at six or eight volts on the other generator.

An electrical engineer of a large plant recently requested a quotation on a straight six-volt double commutator 2000-ampere M.G. set. When the specifications were delivered to him by the manufacturer, the quotation was written up 6-12 volts, double commutators, 2000 amperes, and the electrical engineer immediately took out his pencil and indignantly crossed off the 12 volts. He stated that he wanted a 6-volt generator, was not interested in a 12-volt generator, and that the quotation must be rewritten. The supplier had to convince him that a 6-volt double commutator type M.G. set delivered 6 volts from each commutator. When these commutators are hooked in parallel the machine will deliver 6 volts at the rated amperage. When these commutators are hooked in series, the machine will deliver 12 volts at half the rated amperage. This is true of all motor generator sets; a straight 12-volt motor generator set will deliver 12 volts at the rated amperage with the commutators hooked in parallel and 14 volts at half the rated amperage with the commutators hooked in series. In this connection, I would like to call your attention to a very simple way to compare the output of this generator set to that of water running through a pipe. Amperes of a generator can be compared to gallons of water per minute running through this pipe. Voltage can be compared

to pressure behind that water. Ohms resistance corresponds to rust or any impediments in the pipe. Another problem which has confronted a number of manufacturers is why they cannot reduce the voltage of their machines 50% and increase their amperage 100%. To express this, I will cite a certain manufacturer who had a 5000-ampere 12-volt 60 K.W. motor generator set. He wanted to know why it was that he could not get 60 K.W.s at 6 volts out of this set which would be 10,000 amperes at 6 volts. It was necessary to explain to him that the construction of this machine, which was a straight 12-volt double commutator set had certain cross sections of copper designed to carry 5,000 amperes, and naturally if a pipe were built to carry 5,000 gallons of water per hour maximum, it would be impossible to expect to force 10,000 gallons through this pipe without either bursting your pipe or your pump.

Quite frequently it is desirable to parallel two motor generator sets. If your generators are compound-wound it is necessary in addition to bringing the terminals together, to cross-connect the leads from the brushes before they enter the series fields of each machine. This cross connection is commonly termed an equalizer. It is further necessary in commutating pole type machines to ascertain that the commutating poles will not act as compound winding and it is also essential that both machines have identical characteristics. The two machines should be excited separately and the field current noted on each machine also voltage of each generator be reversing the motor and the excitation, keeping the latter at the same value, if the same voltage and the same amperage are observed in the reverse direction, then the brushes are at the neutral point and no trouble is likely to come from the commutating poles.

If the sets you are paralleling are not compound wound, it will be necessary to make sure that the brushes of the two generators are exactly at the neutral point. These instructions are rather general, but do not apply in all cases, due to different inherent characteristics of M.G. sets.

In selecting an M.G. set, talk your problems over with a reputable manufacturer; be sure you decide on the specifications that most nearly suit your conditions, then look for the machine with the highest efficiency, lowest temperature rise, highest economy, and you will get the most for your dollar spent.

PLASTICS AND PLASTIC MOLDING

By W. O. Gebhart

Read at Anderson, Ind. Branch April 1934

PLASTICS is a generic term covering all natural and synthetic molding compounds. The number of plastic compounds is so great that I shall have only enough time to mention several of them and then discuss in limited detail those of the phenolformaldehyde group: the so-called bakelite type.

The elementary molding process for hot molded materials consists of the following operations, although the last step is missing in many of the molding plants today:

1. Charging material into a heated die or mold.
2. Applying pressure to close the mold and applying heat to effect the cure (or softening in the case of thermoplastics).
3. Chilling.
4. Removal.

Naturally the variations from the above are so numerous that each job has its peculiar cycle of operations. However, all plastics are charged into molds and subjected to heat and pressure. The most important exception to the last statement is the cold molded group which plastics are cold pressed in the mold and later cured in an oven without pressure.

Perhaps it would be well to enlarge upon the elementary molding process by demonstrating some of the variations encountered. I shall let the previous mention of cold molded plastics suffice for that field. After this summary dismissal of the cold molded compounds I can say that there are two major variations under the names of thermoplastic and thermo setting resins.

Thermoplastics do not cure during the molding process—the material is heated to the softening point, formed by pressure in the die, and cooled below the softening point before ejection. Naturally, such plastics will always soften under heat.

Thermo setting plastics cure during the molding cycle and cannot be softened for remolding as can the thermoplastics. Consequently, many molders do not chill the molds before ejection but strip the castings at the molding temperature. These plastics cure by a chemical reaction called polymerization; that is, the product after curing has essentially the same chemical composition as before, but the physical properties are utterly

different. This is in direct contrast to the thermoplastics which do not change in either chemical composition or physical properties. Thermo setting plastics before curing are soluble and fusible; after polymerization they are insoluble and infusible.

Most thermoplastics come to the molder in the form of slabs which he cuts into cubes for charging the dies. The thermosetting plastics, however, come in powder form and are weighed into charges or tableted into pellets. I can safely say that the usual procedure is to cold press the powder in automatic tableting machines. These tablets or pellets are usually made essentially the same shape as the die cavity as this procedure effects a saving in the amount of powder charged because the pellet places the powder exactly where it is needed.

Since heat must be used for all hot molded plastics, the heating media is fundamentally important. Because the latent heat of evaporation of steam makes a large amount of heat available immediately, steam is almost universally used. Some small installations use electricity but the power cost seems to preclude its use for production. Gas heated molds have been used, but the temperature control is very inefficient compared to steam. Since the temperature is important it again seems that steam outclasses other media.

All plastics require pressure for forcing the material into the molds, for effecting heat transfer thru the material, and for creating the necessary density of the casting. Here again the most unassuming media has proven superior as it has in many other industries. Hydraulic pressure is used exclusively because of its ease of application, but mainly because an hydraulic press creates a follow up of pressure which is not present in mechanical presses; that is, speed of closing and pressure are so interrelated that as the material gradually builds up internal resistance the speed of closing decreases and the effective pressure increases as needed.

Plastic molding is an economic and industrial process because plastics are inherently good insulators, because very complicated castings can be produced with relative ease, because most plastics have a finish and an appearance which makes them a material that takes its place alongside steel, wood, glass, and other construction materials, because they are light in weight, because they are relatively cheap, because inserts can be molded into place, because they are resistant to solvents and acids, and

because they offer another much needed material of construction. The above are generalities and can either be enlarged upon or picked to pieces depending upon the view point of the person involved. Surely no one can deny that we have a new material of construction that is gravitating to its natural level.

Perhaps a discussion of the various plastics will better demonstrate their uses. First we have ceramics with which everyone is acquainted. Add to this rubber and you are acquainted with the older plastics. Shellac when mixed with various fillers such as stone is used for poker chips, victrola records, electrical insulators and other applications where heat is not present. Pyroxylin, or cellulose nitrate is at once recognized when we call it celluloid. Its disadvantage is its inflammability.

The more recent plastics made from casein are used for gear shift lever balls and other similar purposes. Urea — formaldehydes represented by the dishes, cups and saucers marketed at first under the name of Beetleware are perhaps the first synthetic resins that can be produced in pastel colors. Cellulose acetate is very similar to pyroxylin except that it is not inflammable.

I could continue naming different plastics for hours, but I wish to hurry to the phenolformaldehydes represented by Bakelite and Durz because today they have the greatest commercial use in the electrical industries — including electrical equipment for cars. I believe that I can safely say that phenolformaldehydes outclass all other synthetic plastics in volume of material used. The automobile industries use about 100,000 pounds per month and the bottle cap and tube cap moulders probably use 200,000 pounds per month. Add to this the usage in clock cases, ash trays, lighters, chairs, furniture and you have an enormous industry. In fact, the story is told that one custom molder used 40,000 pounds (one carload) of powder each day for several weeks!

The synthetic resin used in the bakelite type plastics is made by condensation of phenol and formaldehyde together with a catalyst in a steam jacketed kettle or still. Since the reaction itself produces heat, the steam is really used to control the temperature. This reaction requires from eight to twenty-four hours depending upon the type of resin being made.

After the reaction has progressed to the proper point and the water has been removed the bottom of the still is dropt and the resin spread in a thin sheet over the floor to facilitate rapid

cooling so that the reaction is arrested immediately. After solidifying, the resin is broken, fed into pulverizers and reduced to a very fine powder, which ground resin is mechanically mixed with the filler, the lubricant, and the dye (usually aniline) in a ball mill.

From the ball mill the mixed powder is fed thru steam heated rolls and formed into sheets which are repassed until the polymerization has been carried to the desired point for the molding powder being manufactured. These sheets are broken, pulverized to the desired fineness, and then thoroughly blended in a huge rotating drum. After blending the powder is screened to remove the too coarse and the too fine particles, passed thru a magnetic separator to remove metal inclusions, and then packed into drums ready for shipment to the molder.

The fillers are usually wood flour, but asbestos, stone, cotton linters, cotton flock, paper, linen, in fact almost any compatible substance may be used. The mechanical and electrical properties are affected by the filler used, altho the type of resin also plays a part.

The success of the bakelite type plastics was assured when Dr. L. H. Balkeland about 1908 patented the three stage process which placed the control of the plasticity at the rolls instead of in the resin stills where it was well nigh impossible to control the plasticity commercially. The three stages are:

1. Resin, partly polymerized, soluble, fusible.
2. Rolled sheets and powder, further polymerized, still soluble and fusible. It is here the plasticity is controlled
3. Molded product, completely polymerized, insoluble, infusible. This is the finished product.

The molded casting possesses an excellent finish requiring no additional "finishing coats," is a very good insulator, is reasonably strong, is light in weight, is cheap in fabrication of complicated parts, is resistant to most acids, does not readily absorb moisture, and has a multiplicity of uses.

The plastics industry is still adolescent even tho it is about twenty-six years of age. In these years it has progressed enormously, but it still has only broken the surface skin of knowledge. The future lies before, and it appears to be a wonderful future. Here is a new material of construction that makes possible many of the 50 styled "pipe dreams" of our forefathers.

The material is being misused in many cases, but engineers and designers are learning to fabricate it as a distinctive material, and the industry will see many fat years to follow the past lean years of pioneering.

METAL CLEANING AND METAL CLEANING COMPOUNDS

By H. C. Bernard of Magnuson Products Corp.

Read at Boston Branch Annual Banquet May 26th, 1934

METAL Cleaning Compounds may be grouped as follows: Soaps, and Soap Compounds, Solvents and Compounded Solvents, Alkalis and Alkaline Compounds.

Soap and Soap Compounds, and in some cases Solvents, are used in the metal and electroplating industry primarily for soaking solutions for the purpose of softening and loosening buffing compositions to facilitate their removal from metal surfaces.

This is a preliminary operation to subsequent mechanical or chemical treatment, which is finally necessary for the complete removal of such materials.

Solvents are also used to aid in the removal of oil and carbon smut from unpolished cold or hot rolled steel which proceeds a later treatment in alkaline solutions for entirely ridding the metal of oil and smut film. Incidentally, the use of solvents and distillates in this connection dates back many years, but this practice has not become very general.

Perhaps the reason for this is due to the fact that solvents being more or less inflammable must be used cold, and cold solutions do not readily penetrate through deposits of caked tripoli, lime finish, or rouge, that are usually present on the metal after the buffing and polishing operations, especially where the metal surfaces consist of open work, depressed, or irregular designs.

Therefore, unless a vaporizing equipment is available where the solvent is made part of the process of removing such substances, there is slight advantage to be secured with their use in this connection. A mere immersion of the parts to be cleaned, in cold solvent does not suffice to soften or loosen buffing materials, and only by a prolonged soaking action, or by using a vaporizing system, can satisfactory results be obtained with them.

On the other hand, heated soaking solutions made up with either straight soap, or soap compounds prove most efficient as aids for the removal of buffing compositions from metals, as they have the ability to soften and penetrate through a soaking action, making it possible for the complete and easy removal of such, either by brushing, or placing of the metal parts in an efficient electric cleaner for a minute or two. Soap Compounds, embodying special solvents, are most efficient for making up soaking solutions.

It is possible to combine solvents so as to make them miscible in water, thereby producing an emulsion that when heated to or near the boiling point, acts very rapidly for the disintegration of buffing compounds. However, in order to secure a chemically clean surface, it is necessary to finally clean the metal parts in a regular plater's cleaning solution.

It would seem that little or anything need be said relative to alkaline or alkaline compounded cleaners, but indeed there is more to putting together such compounds than appears on the surface. For instance, only those who are engaged in the manufacture of cleaning compounds know how necessary it is to use correct basic materials, and proportions to effect the right balance of such compounds, this largely depending on the type of cleaning for which they are designed.

Continual research work is necessary to keep abreast of the times, as materials and operations that enter into the polishing and preparation of metals, are constantly changing, which presents new cleaning problems to be solved.

In past years, and even up to the present time, potassium and sodium cyanide has been used as an addition to the regular cleaning solution to increase its efficiency, it is a well known fact that cyanide is a valuable and efficient metal cleansing agent.

However, as a great deal of the efficiency of cyanide is lost, through boiling of the cleaning solution, and the cost of it being excessive compared to the price of prepared cleaners, many platers hesitate to use it. Another objectionable feature attending the use of cyanide in the cleaning tank, is the dangerous and obnoxious fumes that arise from the cleaning solution, especially when it is maintained at temperatures near the boiling point.

Recent developments through research, have made possible a cleaning compound that produces results in metal cleaning equal

to those secured by the addition of cyanide in the cleaning tank, without the attending bad fumes, or the prohibitive cost associated with the use of cyanide. Such cleaning compounds are capable of removing emery paste from polished iron and steel, also tripoli, lime and rouge from buffed brass, copper, etc.

Another method of cleaning that makes for great efficiency in the cleansing and preparing of metal surfaces is electro-cleaning. This is another matter on which there would seem little need for comment, inasmuch as it is in such wide use at the present time. As a matter of fact, this method of cleaning is becoming more popular every year, and perhaps a brief mention of one or two points concerning it will not prove amiss.

First of all, in order to secure real efficiency with electro-cleaning, it is necessary to have a properly compounded product for making up the cleaning solution. Hit and miss cleaners readily break down under electrolysis, and although perhaps the basic materials for such are sometimes low priced, the life of these are exceedingly short, and it requires considerably more pounds of these make-shift cleaners to maintain the cleaning efficiency of the solution, than it does of scientifically prepared cleaners, that cost a few cents more to purchase, but which are the more dependable and economical in the long run.

Cleaning and plating in one solution offers possibilities for securing adhesive electro-deposits, especially in the cases of polished steel and iron. If correctly made up the combination cleaning and plating solution permits the cleaning of the surface of the metal, just previous to any deposit taking place, thus insuring a firm adherent deposit next to the metal, before being removed from the cleaning tank and subjected to the oxidizing influence of the atmosphere.

Such combination solutions are made up with a suitable cleaning compound, sodium cyanide and just enough metallic salts to produce a light film of metal on the work, but not until the work has had an opportunity to be acted upon by cleaning solution for a few seconds, or so, and before taking on a film of metal.

As it must be evident to you at this time, this short paper is in no wise intended to be technical, and was only written solely for the purpose of bringing out discussion relative to the problems entering into the cleaning of metals along practical lines.

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Efficiency Methods

EDWARD H. TINGLEY

COSTS—WHAT ARE THEY—WHAT CAN WE CONTROL?

By Edward H. Tingley
Secretary, National Association of Foremen, Dayton, Ohio.
"Reproduction forbidden without permission of author."

We are all working for the same boss and that boss is our customer. He sets the hours we can work, the wages we are able to pay, the materials we can use, the colors and kinds of finishes we must be prepared to make and the quality of our workmanship. And the customer sets our selling price, for he will pay only what he thinks is fair. Altogether the customers of our products or work, have a great deal to do with our business.

If he sets our selling prices, does he set our costs? Or does he determine how high our costs can be, if we desire to make a profit on his order? To some extent the price the customer is willing to pay does determine how much we can allow the shop for production costs, how much for the office and how much for profit. Some factories have been accepting business, during the past few years, at just shop cost so as to keep the workmen employed. But this is not desirable as a regular practice.

So with the selling price practically fixed, it forces the shop executive to battle hard to keep costs below selling prices. There are so many ways of allowing the costs to creep up, and it is not long before hardly a cent of profit is made on a certain order. A profit is necessary if the company is to remain in business and progress in its methods and equipment.

The recent wage increases suggested by the government have increased, considerably, the cost of manufacture of all products. And this raise cannot always be passed on to the customer. This puts an added burden on the shop foreman to study ways and means to keep costs down as much as possible. Of course many companies cannot continue to increase wage costs, because they will then be paying more than the product is worth to the consumer, and then the consumer will stop buying. And that is not a desirable situation. Low costs will help in a great measure to stimulate sales and production.

Therefore, every live superintendent and foreman will today, more than ever, be studying his equipment, methods and system,

to determine ways to reduce his costs to offset, partly, at least, the wage increases. Labor saving devices are being studied to increase production per man.

Let us look at the elements that make up costs. In general, the total cost to the company must include such items as selling expense, advertising, administration, engineering, financial costs, interest on borrowed money, taxes, insurance, rent, bad debts, depreciation of equipment, material, labor, supervision, fire protection, workmen's compensations, light, heat and power, etc.

As shop executives, we are directly interested in the manufacturing costs — the items which we can control. So we will analyze these.

Manufacturing costs consist of three main divisions:

Materials and supplies.

Labor — performed on the product.

Overhead — items of expense for supervision, power, light, etc.

The first two items are readily understandable. The item of overhead or expense requires more explanation than the other two. This is a very important item, one that accounts for a bigger proportion of the cost of production than most people realize. A good many of the parts of overhead expense go right on whether the plant is turning out products or not. Some fluctuate with the amount of production that is going through the shop. In larger shops, overhead is more complicated than in the small shop, but the principle is the same — an added amount for a variety of expenses must be applied to the materials and labor when computing the cost.

Some of the items of overhead that occur in nearly every shop are: salary of the manager, office help, superintendent and foremen; interest on money invested in equipment, tools, stock, etc.; insurance, taxes, maintenance expense, power, light, heat, supplies, wages for truckers, material men, maintenance men, time clocks, janitors, etc. Many of these items can be controlled by the foremen to keep the amounts expended in line with the production going through the shop.

All three of these items of costs can be controlled by the shop executive although some items seem relatively stable. Good management will be able to keep the usage of supplies and materials, the amount of labor charged to each job, and the variable items of overhead, at the lowest point consistent with quality

workmanship. And that is the game in manufacturing that holds the interest of the right sort of executive. The aim of such a man is "To make a better product at a lower cost." This is Progress in nine words.

Costs are recorded so that the manager, superintendent and foremen can exercise intelligent control over methods, operations and processes. A knowledge of cost facts is the greatest incentive to shop efficiency. The executive knows where he is going — he can put his finger on the high cost operation or the place where money is being wasted.

After all, there is only one thing in costs, over which the foreman has absolute control. He must use a certain amount of materials, of labor and power, heat, supervision, etc. But the thing he can control is the *waste* of all these items. And it is a problem in many shops to detect the wastes, for many are hidden deep and do not readily appear. And many are little wastes, trifling in themselves, but over a month or a year add up to a lot of money. In many companies today, facing keen competition, rising labor costs, and increased costs of materials, — the only hope for a profit is to be found in correcting the wastes of time, energy and materials.

THE WASTE OF TIME

It is not fair to say that in every shop there is a lot of wasted time. There are too many good managers who plan the work so carefully that their men are always employed. In many job shops, however, it is difficult to account for every minute. An organization must be maintained to be able to serve the customer, but most of us will admit that some time could be saved in our departments. It will require a little more forethought in laying out the jobs and keeping things moving. Cost records will show the foreman how much the jobs have cost in the past, and if a similar job comes along he can judge accurately what the new job should cost.

THE WASTE OF MATERIALS AND SUPPLIES

It is rather easy to waste expensive plating solutions such as chromium, by wiring or hooking on the pieces to be plated, in such a way that some of the solution is carried over into the rinse bath. In one plant they use a thinner rinse bath for the first rinse before putting into the water. This makes a substantial saving that reduces costs.

Metals are wasted if the time of immersion is extended beyond the correct point.

There are other wastes that are reflected in the quality of the products and in the costs. These are:

Immersion deposits which spoil the finish.

Improper mixing proportions in the tanks to insure a homogeneous solution.

Lack of care in cleaning the parts.

Improper polishing and buffing methods.

Lack of technical control of solutions.

Improper current densities.

Proper electrical maintenance to insure efficient current distribution.

Waste of light, heat, power, water, steam, etc.

Reoperating poor parts.

Other items will occur to every foreman and he can add them to this list.

It will be an aid in cost reduction if this list is read over each week and certain items carefully checked to determine if that waste can be reduced.

It is easy to take things for granted and allow these little wastes to pile up. Water, steam and power seem plentifully at hand and can easily be wasted. I was going through a shop recently, where the department ceased work at 3:00 P. M. At nearly 5 o'clock, I saw a half inch faucet pouring water into a rinse tank and no workmen in the department. Just carelessness — but a waste nevertheless.

I have often wondered if all our workmen fully appreciated the need for lower costs. It seems that some employees are not in sympathy with time study or planning which results in lower costs of the product. If we were but able to explain to each man how the lowering of the costs of manufacturing any article enables more people to buy that article and this in turn creates more work, I am sure he would take more interest in costs. Think how the cost of our automobile has come down. If it hadn't been cut in half in the last fifteen years, many of us would still be using the street car. Cost reduction is not used to reduce the earnings of the worker, but to enable him to do more in the same time, which is the principle of mass production. Low unit costs, high production and good earnings for the employees, mean a profit for all parties. And if it had not been for mass production, most of us would not

be enjoying the many delights and advantages of the automobile, radio, electric lights, motion picture, etc. Each shop and each department has a responsibility to do its share in keeping down the costs of whatever work is done in that shop.

Relatively few people have any understanding of the extent to which small additions in manufacturing costs are pyramided by successful "mark-ups" until the retailer sells the finished product to the ultimate consumer. For example in the manufacture of woolen cloth for suits, an addition of 25c per yard in manufacturing costs may result in a step up in price of a suit of clothes to the ultimate consumer of from $6.00 to $10.00.

The addition of 15c to the manufacturing cost of a pair of shoes may have the effect of adding some 45c to $1.00 to the retail price of shoes paid by the ultimate consumer.

These illustrations show the effect of higher costs on selling prices. And we all appreciate that higher prices may mean less business for us.

The employee may not see where the small amount of work he does on the product has much effect on the retail price, but costs in most every shop today are figured very accurately and closely. A half cent on a thousand parts per day means $5.00, and on hundreds of parts that go to make up a complete unit, much money can be added to the cost by a half cent here and there.

Cost information which the accountant uses in building up his final statement of costs, is made up of a variety of items, some of which are provided by the foreman directly. Some items come indirectly as a result of shop activities. The foreman must be depended upon for a certain amount of cooperation with the Accounting Department. He must see that any time tickets or cards which he approves are right; he must use material only for the job for which it is requested; he must, at all times, see that the sources of cost information are accurate and dependable. Final cost records can never be more accurate than the source from which this information is obtained.

Many otherwise capable foremen fail in the eyes of management simply because they cannot "cut the corners" on costs. Probably it is true that as many foremen fail from the lack of cost information as from the lack of foremanship ability. If the foreman is not furnished with the proper cost information, the management cannot hold him responsible for the close supervision of his cost items. There is no excuse for the foreman, who having the

facts, does not turn them into productive results. Sometimes a foreman thinks he has done his job if he merely gets his work out on time, in sufficient quantity and of the prescribed quality, regardless of cost. A sensible man always considers the cost when he does a job at his own expense. The foreman should take the same attitude towards getting out the work for his department.

All up-to-date concerns have cost systems. This means that they have an accurate measure of a foreman's worth to the company. The foreman will be judged according to his cost records.

QUESTIONS FOR DISCUSSIONS

1. What arguments can we use to convince our customers that higher prices are justified?
2. If costs and selling prices continue to increase, are we likely to have a "Buyers' Strike?"
3. How can a foreman secure the interest of his workers in keeping down

   The Waste of Time?

   The Waste of steam, water, power and light, etc.?
4. Do you get cost information from your accountant? Does he give you the hours of direct labor or the dollar and cents cost of the operations performed in your department? Which would you prefer? Has this been of value to you in reducing costs?
5. Is a lively competitor good for a shop? Why?
6. How many work under a budget system of expense control? Has a budget helped you to reduce your overhead expenses? How has it done this?
7. Who should be responsible for electrical maintenance or plating barrels, tanks, etc.—the maintenance man or the foreman of the Plating Department?

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The Abstract Section

EDWARD B. SANIGAR

THESE abstracts are mostly adapted, by permission, from "Chemical Abstracts", the references to that publication being given in the form — *C. A.*, **27**, 3402 (1933) *i. e.*, Chemical Abstracts, Volume 27, column 3402 in the year 1933. The name appearing at the end of the abstract is that of the abstractor. Abbreviations for scientific journals are those used by "Chemical Abstracts" (see *C. A.*, **25**, 6019 (1931). E. B. S.

Electrodeposition of rhodium. R. H. ATKINSON and A. R. RAPER. *Metal-Ind.* (London) **44**,191 (1934); *Metal-Ind.* (N. Y. **32**,119 (1934). — After describing the historical development of rhodium plating, and pointing out the properties of rhodium coatings, the authors give directions for preparing plating salts, especially ammonium rhodinitrite. One liter of solution containing 5g. of rhodium as chloride is boiled with 40g. sodium nitrite until light yellow; then 3g. sodium carbonate is added to remove traces of bismuth, and the solution filtered. After cooling, 50 cc. of saturated ammonium chloride solution is added and the precipitate of ammonium rhodinitrite filtered and washed with cold water. The salt (8.52g., containing 2g. rhodium) is fumed down with 33cc. concentrated sulfuric acid, and after cooling diluted to one liter. The best conditions for deposition are: platinum electrodes, 40°C. and a c. d. of 5 amps./sq. ft. The deposits are very white, bright and almost free from porosity. The cathode current efficiency is about 45%. Plating for 15 minutes gives 4.5 milligram rhodium per sq. inch. A few applications for rhodium plating are cited. *C. A.* **28**,3003 (1934). A.E.BEITLICH.

Rhodium plating. U. S. patent No. 1,949,131. February 27, 1934. THOMAS P. SHIELDS. A bright lustrous deposit of rhodium is obtained by the use of an electrolyte comprising an aqueous solution of a soluble rhodium salt such as the sulfate or chloride, a soluble aluminum salt such as potassium aluminum sulfate or aluminum chloride, and a free inorganic acid such as sulfuric acid or hydrochloric acid. *C. A.* **28**, 2627 (1934).

Tarnish-resisting metal. Canadian patent No. 340,067. March 13, 1934. B. BART (to The Precious Metals Developing Co., Inc.) Tarnishable metal is rendered non-tarnishing by electrodepositing over it a coating of nickel and then depositing over the nickel from an acid bath a coating of rhodium. Cf. *C. A.* **28**,2279[1] (1934). *C. A.* **28**, 3007 (1934).

The electrodeposition of indium from cyanide solutions. DANIEL GRAY. *Trans. Electrochem. Soc.* **65**, 4 pp. (preprint) 1934. — Aqueous solutions of indium cyanide dissolved in an excess of cyanide are not very stable. There is a marked tendency for indium hydroxide to separate out. This precipitation may, however, be avoided and the bath rendered very stable by adding a very weak acid, such as glucose or glycine (0.5g. glucose per grain indium content of bath). Soft silver-white deposits of indium are obtained

from this bath of 30-60 gram/liter Indium, at current densities of 1-16 amps./sq. dm. (9-15 amps./sq. ft.) and at room temperature. *C. A.* **28**,3003 (1934).

Theory of chromium plating. E. LIEBREICH. *Z. Elektrochem.* **40**,73 (1934).—Purified chromium trioxide (CrO_3) alone and with foreign acids was electrolysed with gold and platinum cathodes. The current-potential curves for CrO_3 consisted of two branches; foreign acids produced four branches, each having about the same position, regardless of the nature of the acid. With platinum cathodes an additional branch appeared when hydrogen was evolved without deposition of chromium. Perchloric acid and phosphoric acid at high concentration caused reduction; boric did not. The existence of a film on the gold cathode was proved, and the film isolated. The dropping of the potential to negative values was due to saturation of the cathode with hydrogen, directly in the case of platinum, and through the medium of the film in the case of gold. *C. A.* **28**,2624 (1934). C. L. WILSON.

Chrome plating. MAX SCHLÖTTER. *Oberflächentech.* **11**, 40 (1934).—The fact that on chrome-plated brass, especially often-used handle bars, railings, etc., the chromium peels off, must be ascribed to a layer of hydrogen formed during plating between the brass surface and the chromium plate. An intermediate layer of nickel does not help very much, as nickel too, dissolves hydrogen, so that a hydrogen layer comes between nickel and chromium, and hydrogen diffuses through the nickel layer to the basis metal if there is not enough nickel to absorb all the hydrogen. The pressure with which hydrogen diffuses through electrolytically deposited nickel may amount to 10 atmospheres, and this easily explains the fact that the chromium deposit is cracked and thrown off. The nickel layer must be thick enough to absorb all hydrogen generated in chromium plating; the different expansion coefficients are not the cause of the peeling. Degreasing by electrolysis is not to be recommended; bright nickel plating should be applied, so that the object can be brought directly into the chromium-plating bath. *C. A.* **28**,3004 (1934).

Practical regulation of chrome-plating baths in the shop. J. LOISEAU. *Usine* **43**, No. 11,27 (1934). — A review.

C. A. **28**, 3004 (1934) M. HARTENHEIM.

Nickel-chromium plating technique. M. COOK and B.J.R. EVANS. *Metal Ind.* (London) **44**, 279,329 (1934). *C. A.* **28**, 3004 (1934). E. H.

Chromium plating. German patent No. 591,642. January 24, 1934. SIEMENS and HALSKE A.-G. — Elastic, compact deposits of chromium are obtained by the electrolysis of chromic acid (H_2CrO_4), the gas generated at the cathode being led away more or less horizontally, e. g., by conduits.

C. A. **28**,2627 (1934).

Chromium. German patent No. 591,511. January 23, 1934. SIEMENS & HALSKE A.-G. — In the electrolytic deposition of chromium from chromic acid solution, an addition of 1.6% of chloric acid is made to the chromic acid. A small addition of sulfuric acid may also be made. *C. A.* **28**,2627 (1934).

Electro-plating nickel-chromium alloy on metals such as steel plates or sheets. U. S. patent No. 1,948,145. February 20, 1934. G. L. WALLACE (to Fiberloid Corp.). — A cathode, such as sheet steel, and an anode of chromium-nickel alloy are immersed in a bath formed of nickel sulfate, chromium carbonate, boric acid and water (the nickel sulfate being in the proportion of

32-96 oz. and the chromium carbonate in the proportion of 16-32 oz. per gal.). *C. A.* **28**,2627 (1934).

The electrolysis of cupric chloride in methanol solution. E. GUILLERMET. *Compt. rend.* **197**,1608 (1933). — A 5% solution of cupric chloride in methyl alcohol (methanol) was electrolysed at a c. d. of 1.3-5 amp./sq. dm. (12-46 amps./sq. ft.). At the platinum cathode, deposits of cuprous chloride containing 3% copper were formed. A copper anode was superficially converted into cuprous chloride. With a platinum anode, the cuprous chloride cathodically formed remained in solution. The addition of hydrochloric acid and cuprous chloride increases and decreases, respectively, the copper content of the deposits. Low yields are believed due to the recombination of cuprous chloride and chlorine, products of the primary reaction of electrolysis. *C. A.* **28**,2625 (1934).

Electroplating copper on manganin. C. R. COSENS. *J. Sci. Instruments*, **10**,256 (1933). — Surface "demanganisation" by making the wire alternately anode and cathode it concentrated aqueous sodium hydroxide, and following this by treatment in sulfuric acid, allows an adherent copper plating suitable for soft-soldering, to be deposited subsequently. *C. A.* **28**, 3003 (1934). B.C.A.

The electrodeposition of copper, nickel and zinc alloys from cyanide solutions. I. C. L. FAUST and G. H. MONTILLON. *Trans. Electrochem Soc.* **65**, 12 pp. (preprint) (1934). — Copper-nickel-zinc may be simultaneously deposited from potassium cyanide solutions of the metals, as an alloy, zinc is more readily deposited than copper, and both of these metals are much more readily deposited than nickel. The percentage of copper in the deposit is relatively greater than the percentage of copper in the bath. The nickel in the deposit is relatively much less than the nickel in the bath. The zinc in the deposit is more nearly the same as that in the bath. Increase in c.d. favors the deposition of zinc and nickel over copper. However, zinc deposits more readily than nickel with increase in c. d. Increase in temperature causes an increase in the percentage of copper in the deposits. Increase in temperature causes relatively a greater decrease of the zinc in the deposit than of the nickel. At about 50° C. there is a rearrangement of the factors controlling deposition. This causes a reversal in the slope of the curves plotted for the percentages of copper and zinc in the deposit *versus* the percentages of these metals in the bath. The same effect is noticed upon the ternary curves giving the composition of the deposits. *C. A* **28**, 3003 (1934).

Structure of electrolytic copper deposits obtained in the presence of certain colloids. P. JACQUET. *Compt. rend.* **198**, 74 (1934); cf. *C. A.* **27**, 909 (1933). — Copper was deposited from a solution of 125 g./l. crystalline copper sulfate ($CuSO_4.5H_2O$) and 25g./l. sulfuric acid plus addition agent (varying from 1 milligram to 5g./l.), gelatin, serum albumin, gum arabic, gum tragacanth, dextrin or glycine. Each electrolysis lasted 5 hours at 18-20° C. and a c. d. of 2 amp./sq. dm. (18,6 amp./sq. ft.). A section, 1 cm. square, was polished and etched. Three classes of colloids were discernible: very effective (gelatin, serum albumin); average effectiveness (gum arabic and tragacanth); relatively ineffective (dextrin and glycine). The most effective (finest grain size) are the most easily adsorbed. *C. A.* **28**, 2624 (1934).

Ductility and adhesion of nickel deposits. F. P. ROMANOFF. *Trans.*

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Electrochem. Soc. **65,** 16 pp. (preprint) (1934). — The ductility of electrodeposited nickel is a function of the crystal structure and of the contained basic salts and gases. Hard fibrous or columnar nickel structures have an apparent hardening effect on a ductile base even when very thin. This apparent hardening of the base disappears upon removing the deposit. Full ductile conical nickel structures of any thickness will not affect the basis metal adversely. Ductile nickel can be hardened by absorption of hydrogen through action as a cathode in alkaline or acid solutions. Chromium deposition on nickel has the same effect. Part of this hardening can be overcome through vacuum or heat treatment, or by chromium plating under conditions which prevent the absorption of too much hydrogen. Testing for adhesion by the Erichsen extruded cup test, or modifications thereof, is shown to be unreliable. A modified cup test is given which will always detect poor adhesion. *C. A.* **28,** 3004 (1934).

Coloring zinc. French patent No. 758,593. January 19, 1934. HEINZ TICHAUER. — The zinc is dipped into a bath containing an aqueous solution of a salt of a heavy metal, e. g., a sulfate, to which a molybdate, e. g., ammonium molybdate, is added. *C. A.* **28,** 3046 (1934).

Nickel-plating aluminum sheet. R. J. SNELLING. *Metallwaren-Ind. u. Galvano-Tech.* **32,** 28 (1934). — Methods of removing the oxide layer are given, and various suitable plating baths are described. *C. A.* **28,** 2624 (1934).

Plating aluminum with other metals. U. S. patent No. 1,947,981. February 20, 1934. J. FISCHER (to Siemens & Halske A.-G.). — For producing firmly adherent coatings, articles of aluminum or its alloys are subjected to an electric current in a bath containing electrolytes of such nature as to produce an electrolytic coating of oxidised character; the articles, thus treated, are flash-coated electrolytically in an alkaline bath with a metal such as copper, brass, cadmium, silver or gold, and the flash-coated articles are then finish-coated electrolytically. *C. A.* **28,** 2627 (1934).

A new method for prevention of corrosion of aluminum and its alloys. M. TASAKI. *Tetsu to Hagane* (*J. Iron Steel Inst. Japan*) **20,** 42 (1934). —To prevent corrosion, aluminum is anodically oxidised at the same time that it is being annealed, in a bath which is kept at 500° C. for duralumin, or at 230° C. for pure aluminum, and which contains equal parts of potassium nitrate and sodium nitrate. Alternating current is used at 65 volts and 0.04 amp. /sq. cm. (37 amps./sq. ft.) for duralumin, or at 100 volts for aluminum. After 30 minutes for duralumin, or 1 hour for aluminum, the metal is quenched in water and washed. Changes in the bath, effects of impurity, loss of the salt, recovery of the salt and analytical methods for impurities were studied. Corrosion resistance produced by this method is equal or superior to that by other methods, and the mechanical properties of the metal are not injured. *C. A.* **28,** 2660 (1934).

Electrochemical production of oxide films on aluminum. *I. Electrolysis in sulfuric acid solution.* D. V. STEPANOV, T. G. LYAPUNTZOVA, D. L. KAMKIN, D. L. BERDICHEVSKAYA, G. A. SHCHEPETIL' NIKOV. *J. Phys. Chem.* (U.S.S.R.) **4,** 395 (1933). — The peculiarities in behavior of aluminum electrodes were studied in sulfuric acid solutions in relation to various electrical and chemical factors with the object of obtaining oxide layers of good insulating properties. Both direct current and alternating

current were tried. The curves for increase in the overvoltage in the baths during the process of formation of oxide films were obtained. The relationship of the gap over-voltage of films to the concentration of electrolyte, current density, etc., was determined. Films obtained had a gap overvoltage of 600 volts on formation by alternating current, and of 800 volts on formation by direct current. Qualitatively it was shown that films produced by alternating current had a large elasticity. Addition to the electrolyte of aluminum sulfate had no influence on gap overvoltage and elasticity but reduced the current density permissible and raised the overvoltage.

C. A. **28,** 3003 (1934). G. FAERMAN.

Coating aluminum. French patent No. 758,545. January 18, 1934. Aluminum Colors Inc. — Aluminum or its alloys is coated by anodic treatment in a bath of sulfuric of 35-60% by weight and under such conditions that the anode is kept at a low temperature. *C. A.* **28,** 3007 (1934).

Protecting aluminum. French patent No. 758,363. January 15, 1934. Aluminum Colors Inc. — Aluminum and its alloys are protected by a layer of oxide formed by a solution of sulfuric acid in an electrolytic cell, aluminum being the anode. *C. A.* **28,** 3007 (1934).

The electrodeposition of rubber on a zinc anode. B. DOGADKIN and D. SANDOMIRSKY. *Rev. gén. caoutchouc* **10,** No. 97,17 (1933). — During the electrophoresis of rubber on a zinc anode in a weakly alkaline latex (below 2% ammonia) there is a sudden drop in the current and a corrsponding diminution of the rate of deposition of rubber, and after a short time the deposition practically ceases. On the other hand, in a strongly alkaline bath, i. e., above 3% ammonia, the rate of deposition remains practically constant. The addition to the latex of salts whose anions form soluble compounds with zinc, reduces considerably the magnitude of this drop in the current. This was true of sodium chloride, potassium nitrate, sodium sulfate, potassium thiocyanate, and sodium acetate, which form salts which diffuse into the rubber film, as shown by ash determinations of the latter. The electrodeposition of rubber on zinc electrodes surrounded by a plaster or glass diaphragm, takes place at a practically constant rate, independent of the concentration of alkali in the latex. Addition to the bath of salts whose anions form insoluble compounds with zinc, has no influence on the electrophoresis, i. e., the rate at which rubber is deposited diminishes as suddenly as with latex containing no ammonia. This was true of sodium sulfite, potassium ferrocyanide, secondary potassium phosphate (K_2HPO_4) and ammonium oxalate. The action of salts of the second group and the action of alkalies are explained by the nature of the phenomenon at the anode and by the structure of the film of rubber deposited i. e., by the formation of a compact, non-conducting film of rubber and insoluble zinc salts, combined with proteins and other serum substances by adsorption.

C. A. **28,** 2939 (1934).

Polishing metals. French patent No. 757,702. December 30, 1933. Udylite Process Co. Zinc, cadmium and magnesium are given a brilliancy by dipping them in an oxidising bath, not nitrogenated, and containing an acid or a base, e. g., an aqueous bath containing chromic acid and sulfuric acid or sodium permanganate and sodium hydroxide. *C. A.* **28,** 2670 (1934).

Alkaline anodic pickling of high-speed steel. R. R. ROGERS. *Trans. Electrochem. Soc.* **65,** 4 pp. (preprint) (1934). — High-speed steel parts are

anodically treated at 2.7 amps. /sq. dm. (25 amps./sq. ft.) in an alkaline bath containing 115 g./l. sodium hydroxide + 15 g./l. citric acid. When the gas evolution is entirely uniform, the pickling has been completed. The parts are then washed and dipped for an instant into a hydrochloric acid solution. The alkaline anodic treatment causes tungsten to go into solution with comparative ease, whereas in the older hydrofluoric acid dip, the interaction with tungsten compounds was unsatisfactory. *C. A.* **28**, 3005 (1934).

Cleaning metals. British patent No. 403,373. December 15, 1933. J. H. GRAVELL. — A delutible composition for cleaning metal surfaces, e. g., motor car bodies prior to painting, comprises a trihydric metal-eching mineral acid. e. g., phosphoric acid, ortho-arsenic acid, and a sulfonated hydrocarbon wetting agent compatible with aqueous solutions of acids and alkalies, e. g., "Neomerpin" ("Nekal"). A solvent, increasing the solubility of the wetting agent, e. g., alcohols, ketones, ethers, esters, may be added. In British patent No. 403,374, December 15, 1933, soldering fluxes are removed from metal surfaces by an aqueous alkaline solution comprising an alkali, e. g., sodium hydroxide, sodium carbonate, borax, trisodium phosphate, and an alkali salt of "Neomerpin" or other sulfonated aromatic hydrocarbon having an isopropyl radicle attached to the nucleus. An indicator to show when the alkali is used up is preferably present. *C. A.* **28**, 3049 (1934).

Cleaning silver articles. German patent No. 569,473. February 19, 1934. F. STURMTHAL. — The articles are placed in an aluminum vessel containing a solution of sodium bicarbonate, soap and an aldose. A suitable solution is prepared by dissolving in one liter of water, 10g. of a mixture containing sodium bicarbonate 92.5, soap 5, and glucose 2.5%. *C. A.* **28**, 3198 (1934).

Contact cleaner for silver, etc. German patent No. 556,719. November 28, 1933. TROST NACHF. — A contact cleaner for noble metals consists of soda and a wrapping of aluminum foil. *C. A.* **28**, 2862 (1934).

Protecting silverware from tarnishing. U. S. patent No. 1,949,205. February 27, 1934. G. E. HERRING and F. E. DEAN (to Associated Silver Co.) — An apparatus is described, suitable for treating the air of show cases, etc., in which are placed chemicals, such as lead acetate and calcium chloride, adapted to remove tarnishing gases and moisture from the atmosphere. *C. A.* **28**, 2862 (1934).

Impregnated fabric for protecting silverware from tarnishing. U. S. patent No. 1,949,781. March 6, 1934. A. D. CHAMPLIN. — Fabric suitable for wrapping silverware is impregnated with a solution of salts such as aluminum sulfate, borax and sodium sulfate. *C. A.* **28**, 2862 (1934).

Gold as a corrision resistant. P. STEIN and O. P. van STEEWEN. *Werkstoffe und Korrosion.* **8**, 37 (1933). — Gold in the form of plating has the advantages of being resistant to oxidation, acids and alkalies; it has low heat radiation coefficient, small crystal structure and other advantages which are discussed. *C. A.* **28**, 3043 (1934). M. C. ROGERS

Selenium rectifiers for electroplating plants. K. MAIER. *Metallwaren-Ind. u. Galvano-Tech.* **32**,67 (1934). — Circuits for various sizes and kinds of electroplating plants are described. *C. A.* **28**, 2625 (1934). C. L. WILSON

Direct determination of the number of active centers on a crystalline metallic cathode. N. THON. *Compt. rend.* **197**, 1606 (1933). — Copper was deposited from a solution containing 200 g./l. copper sulfate crystals ($CuSO_4 \cdot 5H_2O$) and 30 g./l. sulfuric acid, at a c. d. of 0.4 amp./sq. dm. (3.7 amps./sq. ft.). For a deposit 0.3 mm. thick an average of 3.0×10^5 crystals per sq. cm. was found; at higher c. d. the number of crystals was greater.

C. A. **28**, 2625 (1934).

Examination of electrolytic silver deposits by X-rays. G. R. LEVI and M. TABET. *Atti accad. Lincei* **18**, 463 (1934). — Bright deposits of silver were examined. The silver is deposited in isodiametric particles, whereas chromium is deposited as plates (*C. A.* **27**, 5251 (1933). This is proof that plate structure is not a necessary condition for producing bright deposits,

C. A. **28**, 3003 (1934). A. W. CONTIERI.

Mounting of small metallographic specimens and metal powders in bakelite. H. M. SCHLEICHER and J. L. EVERHART. *Metals* and *Alloys* **5**, 59 (1934). — Bakelite resinoid is used as mounting medium, the hardening taking place by heat alone (temperature ranging from 85° C to 130° C.)

C. A. **28**, 2651 (1934). D. S.

The mechanics of adherence in metal plating. K. ATLMANSBERGER. *Oberflächentech* **11**, 15 (1934). — The problem of good adherence of layer to the surface of a metal is discussed for varnishing, enameling and plating. Electrolytic plating is considered, like galvanizing, to be an alloying process between basis metal and cover, the latter diffusing into the former and forming with it solid solutions or inter-metallic compounds; the crystal lattices grow together. Hydrogen retards the formation of an alloy. One reason for unsatisfactory adhesion is that all electrodeposited metals tend to contract during deposition, in particular nickel, cobalt, iron, chromium, etc., which absorb hydrogen easily; this causes internal stresses. The best adhesion is obtained when the formation of solid solutions between basis metal and deposit is as complete as possible, that is, if the crystals of the basis metal continue to grow in the same crystal lattice during electrodeposition. For this reason the metal must be as clean as possible. The adhesive force is determined by measuring that force which is required to lift a deposit off the basis metal. Some other tests by twisting, Brinell test and the Erichsen are mentioned.

C. A. **28**, 2653 (1934).

Devices for passing wire through degreasing, pickling, plating, etc., baths. British patent No. 403,136. December 21, 1933. MAC SCHLÖTTER.

C. A. **28**, 3049 (1934).

The history of the development of electroanalysis. In memory of Alexander Classen. H. FISCHER. *Angew. Chem.* **47**, 129 (1934).

C. A. **28**, 3006 (1934).

Heavy hydrogen and heavy water in electroplating. H. M. FORSTNER. *Oberflächentech.* **11**, 39 (1933). — Since H_2 (Heavy Hydrogen or Deuterium) and Heavy water (Deuterium oxide) can be produced most conveniently by electrolysis, and particularly by electrolysis with nickel electrodes in sodium hydroxide solution, possibly many of the difficulties and failures connected with nickel plating can be traced to the accumulation of heavy water in the electrolyte. *C. A.* **28**, 3004 (1934).

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ROCHESTER BRANCH

On Friday night May 18th, the Rochester Branch held its regular monthly meeting at the Seneca Hotel. After the minutes were read the committee in charge of the Bowling Party gave its report which was accepted with a rising vote of thanks to the Committee. Communications were then read and quite a discussion took place on the resolutions to be presented at the annual convention. The election of officers was next on the order and on motion of Mr. Gartland, seconded by Mr. Mayer, that all the officers for the year 1933-34 be re-elected by acclamation for the coming year, it was so carried.

On Saturday morning, May 19th at his home, 55 Edmund St., Mr. Charles Puffer, age 76 years, died. Mr. Puffer was a charter member of the Rochester Branch and one of its most ardent supporters. Funeral from his home, on Tuesday afternoon, May 22d. The branch was represented by Pres. Kohlmeier who was an honorary pall bearer. May we extend our heartfelt sympathy to Mr. Puffer's family on the loss of a dear one.

BOSTON BRANCH

On Saturday, May 26th at the Manger Hotel, Boston Branch was the host to 125 New England Electro-Platers and Manufacturers who are engaged in the finishing of metals.

Mr. Louis A. Gale was chairman of the Technical session held in the afternoon. The first speaker of the afternoon was one of our members, Mr. Donald Wood, the subject of his talk was "Buying From the Job-Plater." He told of the difference in the plating that is being done in the job-shop and the plating that is being done in the Silver shops. He answered all questions for those present.

The next speaker was Mr. Harry C. Bernard of Magnuson Products Corp. The subject of his talk was "Recent Advances in Cleaning Methods." He spoke of the improvements made for the plater to handle his work. To-day he wires his work and instead of using the brush to clean it all he has to do now is to run it through the cleaner and the work is ready for the plating bath. He also told of the cleaner that removes lacquer without hurting the finish. He also answered questions. His article appears in this issue.

The next speaker was the best friend the American Electro-Platers' Society has to-day, Dr. William Blum, Chemist U. S. Bureau of Standards, the subject of his talk was "The Protective Value of Plated Coatings on Steel." The Doctor spoke of the good work being done by the Society and went on to tell about the test that had been made on the samples exposed to the air in different parts of the country.

He passed samples of Nickel, Chromium, Cadmium, Zinc plates around that had been placed in different parts of the country. He explained the reason for the different effects of each sample taken from all parts of the country. Some of these samples were fairly good while others were very poor.

The Doctor went on to say that he hoped that the American Electro-Platers' Society would continue their research work with the Bureau of Standards at Washington. He answered a number of questions.

The last speaker of the afternoon was our old friend, Mr. George B. Hogaboom, whose subject was "What is under the Plate." He told of the troubles that platers have in plating some metals such as die castings for which the plater is sometimes blamed when the work goes bad. He stated that this is caused by the spots left in the castings or the metal if it has been rolled. He also answered questions.

A vote of thanks was voted to all the speakers for their very interesting talks, after which the meeting adjourned for an hour so that all present could get acquainted before dinner was served.

At 6:30 some 125 guests sat down to the best banquet the Branch has ever held. Mr. Frank Clark acted as Toastmaster. After all had partaken of the good eats the toastmaster called on the following for a few words: Dr. Blum, George B. Hogaboom, our first President Mr. Frank Mackie, now gentleman farmer, Mr. A. P. Williams of our Branch, Mr. William Cahill of Providence Branch, and the next speaker the toastmaster introduced was the chairman of the banquet committee who was congratulated for the great job he had done in putting the banquet over. He hoped that the Branch would send a delegate to the Convention and that the Convention would be brought to Boston and that Mr. Rylander would be chairman of the committee to put it over. He said that he would try to do his best if the Convention could be brought to Boston.

Mr. Gale thanked all those present for their co-operation in making the banquet a success.

A. W. GARRETT, *Sec'y-Treas.*

Boston Branch met Thursday, the 7th at the American House at 8 P. M. Minutes of the previous meeting read and approved. Communications were read and bills passed.

Report of the banquet committee was made by the chairman, Mr. Rylander, he reported that it was the best that the Branch has ever held. A vote of thanks was given him for the good work that he did to make it a success.

Election of officers were next in order and the following were elected: President Charles F. Campbell, Vice-President Edward T. Ehrhardt, Secretary-Treasurer, A. W. Garrett, Librarian Donald Wood, Board of Managers Eric Rylander, Charles O. Hardy, Louis A. Gale.

The Branch will not meet again until the Fall.

After the regular business the members had a "get-together" for an hour and discussed different questions, adjourning at 10.30 P. M.

A. W. GARRETT, *Secretary*

HARTFORD-CONNECTICUT VALLEY BRANCH

The Hartford-Conn. Valley Branch held its regular monthly meeting on Monday evening, May 28, 1934, at the Pequabuck Golf Club House, Pequabuck, Conn.

The members enjoyed a round of golf in the late afternoon, which was followed by a very delicious lunch. We are indebted to associate member, Mr. Apley N. Austin, for the fine time in the afternoon as well as the lunch.

The business meeting in the evening was presided over by Past Pres. Beloin, Minutes of the previous meeting were read and accepted. All communications were read and placed on file.

At this meeting, it was voted to petition the Supreme body, through our delegates, the privilege of changing the name of the branch. It was also voted to give all delinquent members one month's time to pay up all back dues or be subject to expulsion.

Delegates and alternates were elected to the National Convention. The same branch officers are to be retained until after the Convention.

Mr. W. G. Aurand, of Wallingford, Conn., an associate member, was suspended.

The Committees in charge of the joint Educational Session and Banquet, held in Hartford, Conn., on May 19, 1934, reported a very successful affair. No financial report could be made, due to some bills yet to be paid as well as some money yet to be received.

The meeting was attended by fourteen members and visitors. It was voted to hold our June meeting at the home of Mr. E. M. Stephenson, 244 Whiting Lane, West Hartford, Conn., on Monday evening, June 25, 1934.

Meeting was adjourned at 11:00 P.M. V. E. GRANT, *Secretary.*

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held June 2nd at the Atlantic Hotel. Mr. F. J. Hanlon opened the meeting with Mr. J. Hoefer and Mr. H. A. Gilbertson as the other officers. Mr. Gilbertson, our National Secretary, then proceeded to install the 1934 officers. The meeting was then turned over to E. G. Stenberg, our President. This, our annual Convention Booster meeting, as well as our installation of Officers, was attended by most of the Chicago membership.

One new application was received and a committee appointed on same.

O. Weickmann, L. Major, V. V. Beach, were elected to Active membership, after which Bob Meyers welcomed the new members with our ritual.

Mr. C. Kocour demonstrated a new testing comparator which proved to be very interesting.

The meeting was then turned over to our Librarian who found the following questions in the box:

No. 1. *Which gives the better performance in chrome plating antimony, lead anodes or tin lead anodes?*

Ans. Depends on conditions. Tin is not as good as antimony in high current density but tin gives you a much harder anode and seems to last longer.

No. 2. *How much silver per* 1 *sq.ft. is deposited in* 30 *minutes in a regular silver solution?*

Ans. In a solution of 3 oz. Met silver, 2½ oz. free cy. at 10 Amp. per sq.ft. for 2 hours will deposit 1/1000.

No. 3. *What is a good brightener for a cadmium solution, work is not polished or scratch brushed?*

Ans. Glue or Postum.

No. 4. *How fast does lead go into a chrome solution?*

Ans. The lead goes into a chrome solution very fast if it is pure lead. Depends on the density and temperature of the solution, that is why it is best to use antimony lead.

No. 5. *What is the best acid to regulate p. H. of the Nickel sol. Sulphuric or Muriatic Acid?*

Ans. Either is O.K. Depends on condition of the solution but most platers use Sulphuric.

No. 6. *What causes lack of throwing power in a cyanide copper solution? Any* 3.5 *oz. copper cy.* 2 *oz. sodium cy.* 2 *oz. sod. carb. current density drops from* 40 *amp sq.ft. to* 20 *amp per ft.*

Ans. ADD more cyanide.

LOS ANGELES BRANCH

At the open meeting of the Los Angeles Branch, held at the Rosslyn Hotel June 15, 1934, there were fifty-four present.

The meeting was opened by Pres. M. D. Rynkofs, who spoke briefly on the purpose of the A.E.S. The meeting was then turned over to the committee

chairman, Frank Rushton. The first speaker was Mr. H. Clark. He gave us an interesting talk on Heavy Water, telling us as much as is known today about what it is, how it is made and what might be its possible uses in chemistry and electro-deposition of metals.

The musical entertainment for the evening was furnished by an old friend of the Branch, Miss Gladys Thomas.

The principal speech of the evening was by one of our honorary members Dr. S. Fischer. He talked on "brighteners" in general and on those used in nickel solutions in particular. He explained that the lustre or brightness depends on the fineness of the deposit, so in choosing a brightener choose one that will not deposit any foreign material along with the metal you are depositing. Any colloidal substance deposited with the metal tends to separate the molecules of the metal you are depositing and thereby deaden its lustre. Dr. Fischer stated that in his experiments he had obtained good results using gum tragacanth as a colloid. Among the compounds he had tried he found the best results were obtained using the heavy ethers. Also he got good results using organic acids such as lactic acid treated with sulphuric acid. Good results can also be obtained using various metals as brighteners, such as cadmium or zinc in a nickel solution. In using these, however, care must be taken to use just the right amount. The current density, the metal content, the temperature and the amount of brightener must always balance to get the best results. He suggested that a natural bright plate would probably offer more corrosion resistance than a plate that had to be buffed bright because the texture of the former would be finer, that is the molecules would be closer together.

After Dr. Fischer's talk the question box was passed around and it produced the following questions:

Q. Would agitation help to get a bright deposit? A. Yes.

Q. Is it possible to have a hot bright nickel solution?

A. Yes. Solutions to which gums are added work at 80° to 100° F.

Q. What is a good brightener for Cadmium solution?

A. Postum and ammonia used together.

Q. What is a good brightener for a brass solution?

A. Arsenic, but use very little. Ammonia works fairly good and is safer.

Q. Can barium cyanide or barium chloride be used to precipitate the carbonates in a cyanide solution?

A. Barium cyanide can. The precipitate would be an insoluble barium carbonate. Barium chloride would not be practical. It would form sodium chloride, a soluble salt that would cause trouble.

Q. What is the best method of removing the stains of chromium solution from work that is hard to rinse clean?

A. Dip in solution made of 2 parts sulphuric acid and one part water.

Q. Why does steel rust quicker when chromium plated than when just nickel plated?

A. Chromium oxidizes slightly and in connection with moisture this forms chromic acid which is one of the most corrosive substances known.

Q. What causes lead coils to disintegrate in a chromium solution?

A. Probably the steam pressure on the inside of them has a lot to do with it. Best results are obtained if coils are of copper to withstand the steam pressure and then lead coated to protect them from the chromic acid.

Q. How is the best method to control the cadmium when used as a brightener in a nickel solution?

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Prompt Deliveries and Skillful Service

A. Take a known quantity of nickel solution and add a known quantity of cadmium to it. Analyze nickel solution and determine exact amount of cadmium needed. Then add the proper amount from your mixture to it.

Some of the members brought samples of bright nickel deposits, bright cadmium and some beautiful samples of plating on non-metallic substances such as plaster paris and glass. There was also a nice exhibit of silver plating on soft metals. Also beautiful chromium plated flatirons etc.

The meeting adjourned at eleven o'clock and everyone agreed that it was the best meeting we have had in a long time.

EARL COFFIN, *Secy.-Treas.*

WATERBURY BRANCH

The Waterbury delegation to the recent Supreme Convention of the A.E.S. held in Detroit, arrived home pretty well pleased with the outcome of affairs. The party which consisted of fifteen, reported a good convention and a fine time. The selection of Bridgeport, Conn., as the place for the 1935 convention, met with the approval of all. Many seemed to think that it will help to increase the interest of the plating fraternity in general and be the means of building up the various Branches around this section. The decision to continue the work of the Research Bureau for the next two years, and the means adopted to finance same met with favorable comment. Whilst thanks are due to many for contributions and aid to the Research Fund in the past, yet many think that the United Chromium Corp., a branch of which is located in this city, are to be especially commended for their unsolicited offer to further the Bureau's efforts in its darkest financial hour. It is to be hoped that the liberal action of this company will be the means of creating a greater interest in the work of the Research Bureau, on the part of other corporations that benefit by the explorations of the Bureau in the plating field.

W. K. GUILFOILE, *Secretary.*

BRIDGEPORT BRANCH

The Bridgeport Branch held its regular monthly meeting on Friday, June 2 in the Chamber of Commerce rooms, President Al Rosenthal presiding. Communications were read, those from H. A. Gilbertson were tabled. A communication from headquarters was ordered placed on file.

Applications were received and accepted from Elmer Munson and Donald Wittmer, active members. The resignation of William Fallon was accepted. WM. FLAHERTY, *Secy.*

NEW YORK BRANCH

The last meeting of the fiscal year held on May 25, was very well attended. The most important business of this meeting was election of officers to serve and represent us in the coming year.

The officers elected are as follows:

President—Mr. John Rolff
Vice-Pres.—Mr. Ralph Liquori
Sec.-Treas.—Mr. Frank MacStoker
Rec. Sec.—Mr. Arthur Wallace
Librarian—Mr. Nathan Fleiterbaum
Sergt. at Arms—Mr. Harry Carlin
Asst. Sergt. at Arms—Mr. Samuel Goldstein
Trustees—Mr. William Fisher, Mr. Justin Stremel, Mr. Benjamin Nadel.

One of our old time members, Mr. Bittner, gave an interesting talk on the damage done to some of our largest municipally owned statues and other metallic works of art, by men unskilled in the art of metal finishing. One has but to look at some of these so called "refinished" statues to realize the importance and timeliness of Mr. Bittner's remarks, for not only has the patina

been destroyed, but in many cases the marble has been affected by the strong acids used. Mr. Charles Proctor, suggested that this matter be brought to the attention of the proper authorities, to see that this condition is remedied and such work being done by properly skilled artisans.

Mr. Charles Proctor, with his family, sailed on the President Van Buren, May 31, on an extended sea voyage, expecting to be gone a few months. The members wished Mr. Proctor "Bon Voyage" President Rolff appointed a committee to see Mr. Proctor and his family off and to extend the felicitations of the Branch.

At our meeting on June 8th, the new officers were duly installed by our good friend Mr. William Voss. In his inimitable way "Brother Bill" delivered an eulogy on each incoming officer interspersed with fitting remarks of advice in the proper conduct of the office.

The meeting was adjourned at an early hour in order to permit the members to partake of refreshments, as is the custom on the night of installation of officers.

With everyone having a good time, it was apparent that besides being primarily an educational organization, New York Branch is helping to make it a social one, as it should properly be in order to progress.

A regular meeting was held on June 22, when it was announced that Mr. Phil Morningstar was still confined to his home. Mr. Morningstar's host of friends wish him a speedy recovery and hope he will be with us soon again.

An interesting problem came up at this meeting as to the process and formula for bright gold plating, stainless steel pen nibs so as to stand a nitric acid test. Through productive of a lively discussion, this question was not answered to the satisfaction of the member who asked it. Probably a member of another branch has had experience with this type of work, and would send in a suggestion as to how this could best be done.

ARTHUR WALLACE, *Rec. Sec.*

TORONTO BRANCH

Our new officers were greeted by an unusually large number of members at our June meeting. Mr. John Acheson gave us an example of how he intends to conduct the meetings during the coming year, start on time, attend to business matters thoroughly, but speedily, keep to the subject during discussion of a question and avoid useless chatter, adjourn at a reasonable hour and expects at least one new application each month. We all feel confident that Toronto Branch is going to do things this year.

Mr. Walter S. Barrows, our delegate to the Detroit Convention presented a detailed report of the proceedings of June 11th to 14th. In fact his word picture of the Convention consisting of seventeen type written pages kept us quiet for over an hour. He told us the 1935 convention will be held in Bridgeport, *Rhode Island.*

Question Box—Who moved Bridgeport?

Answer—Dunno, but it looks like an act of Providence.

Question—What would cause a steel tank containing brass solution to become perforated along center of bottom?

Answer—Local action. Remedy—increase distance between anodes and sides of tank, or connect the anode rods to the tank by means of a thin wire. This should also avoid metal deposits on the sides of tank.

Question—Can Cadmium be used as an undercoating for nickel instead of cyanide copper deposit?

Answer—Nickel can be successfully deposited over Cadmium but, it has not proven durable when subjected to ordinary atmospheric influences.

Question—What is the simplest way to finish soft sheet brass stamping which is to be chrome plated?

Answer—Rag wheel or tampico brush with tripoli, color buff, using Vienna Lime. Clean, nickel plate, buff and chrome plate.

Toronto Branch will not meet again until September 24th. Then Mr. Acheson plans to have a speaker for every alternate meeting, and he intends to have members of Toronto Branch participate at the other meetings by presentation of short papers. So-o-o-o-o-o-o, it looks mighty good to we'uns.

To members of Toronto Branch

Get prospective members lined up, secure application forms from the Branch Secretary and have the applications ready by Sept. 24th. Application fee is $5.00, yearly dues are $6.00, regardless of where you live or who you are. Let's show 'em how.

H. W. GRAHAM, *Secy.*

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APPLICATIONS

Donald E. Wittmer, 84 Grandfield Ave, Bridgeport, Conn.	Bridgeport
Elmer Monson, Underwood-Elliott-Fisher Co., Bridgeport, Conn.	Bridgeport
Oscar Weickmann, 2744 Pine Grove Ave., Chicago, Ill.	Chicago
Laurence Major, 606 W. 72nd Street, Chicago, Illinois	Chicago
Vernon Beach, 559 W. 59th St., Chicago, Ill.	Chicago
C. R. Crawford, 4534 W. North Ave., Chicago, Ill.	Chicago
Harry Dolgin, 495 Elson St., Brooklyn, N. Y. Assoc.	Newark
Arnold Oppenheimer, Route No. 1, Chatham, N. J.	Newark
Nicholas Milo, 724 South 20th St., Newark, N. J.	Newark
H. A. Krunviede, c/o E. R. Squibb & Sons, New Brunswick, N. J	Newark
John B. Kotches, 244 Westfield Ave., Elizabeth, N. J.	Newark
Cyril Hamlin, 123 Seymour Avenue, Newark, N. J.	Newark
Samuel Piccariella, 1115 69th St., Brooklyn, N. Y.	New York
Emillo Jaconio, 8923 86th St., Woodhoven, L. I.	New York

ELECTIONS

Amos Earl Judd	Baltimore
Donald E. Wittmer, 84 Grandfield Ave., Bridgeport, Conn.	Bridgeport
Elmer Monson, Underwood-Elliott-Fisher Co., Bridgeport, Conn.	Bridgeport
Oscar Weickmann, 2744 Pine Grove Ave., Chicago, Ill.	Chicago
Laurence Major, 606 W. 72nd Street, Chicago, Ill.	Chicago
Vernon Beach, 559 W. 59th Street, Chicago, Ill.	Chicago
Harry Dolgin, 495 Elson St., Brooklyn, N. Y. (Assoc.)	Newark
Arnold Oppenheimer, Route No. 1, Chatham, N. J.	Newark
Nicholas Milo, 724 South 20th St., Newark, N. J.	Newark
H. A. Krunviede, c/o E. R. Squibb & Sons, New Brunswick, N. J.	Newark
John B. Kotches, 244 Westfield Ave., Elizabeth, N. J.	Newark
Cyril Hamlin, 123 Seymour Avenue, Newark, N. J.	Newark
Anthony F. Cassin, 3456 Denton Ave., Hamtranck, Mich.	Detroit

TRANSFER

J. J. Walsh, member at large to Chicago Branch

REINSTATEMENTS

F. E. Revell, 916 Gladstone Ave., Windsor, Ontario, Canada	Detroit
Martin B. Apy, 2010 New York Ave., Brooklyn, N. Y.	New York

RESIGNATIONS

R. J. McMeeken, 2640 Forest Grove Ave., Wyoming Park, Mich.	Grand Rapids
Keith Kennedy, 1334 Logan St., Grand Rapids, Mich.	Grand Rapids
Geo. A. Wilson, 360 W. 23rd St., New York City	New York
Wm. Fallon	Bridgeport Branch

DEATH

Charles Puffer, 53 Edmund St., Rochester, N. Y.	Rochester

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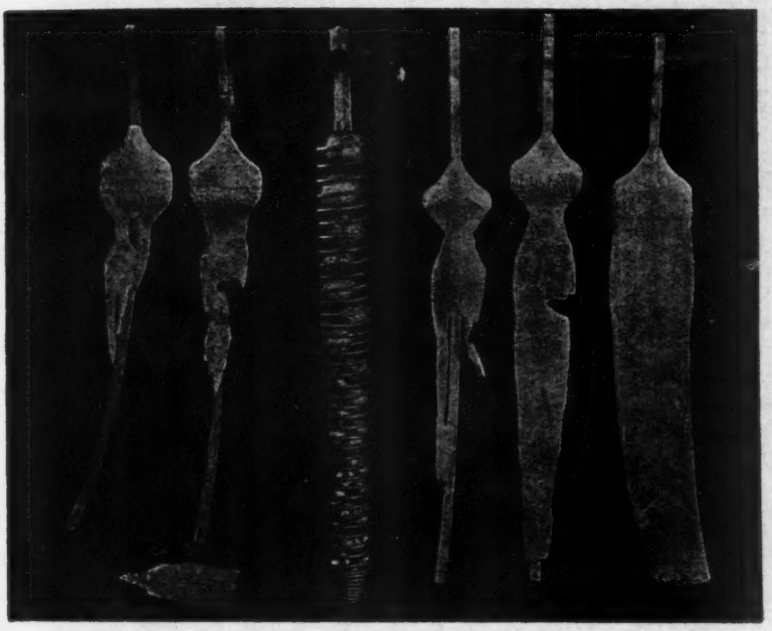
WHY BALL ANODES?



This picture tells a story! Before your eyes is the reason why we developed the ball anode* and container.

Note how the slab anode gradually disintegrates. Some portions corrode much faster than others. Look at the piece which fell off. That piece cost money and it is wasted. What is going to happen to that chunk of metal on the strap at the extreme left? If you are lucky, you can reclaim about 50 per cent of it.

Now compare this with the ball anode. Every ounce of the cadmium ball is used. None is wasted. The anode area never varies. As the balls corrode they descend in the container, and you put a new ball at the top.

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